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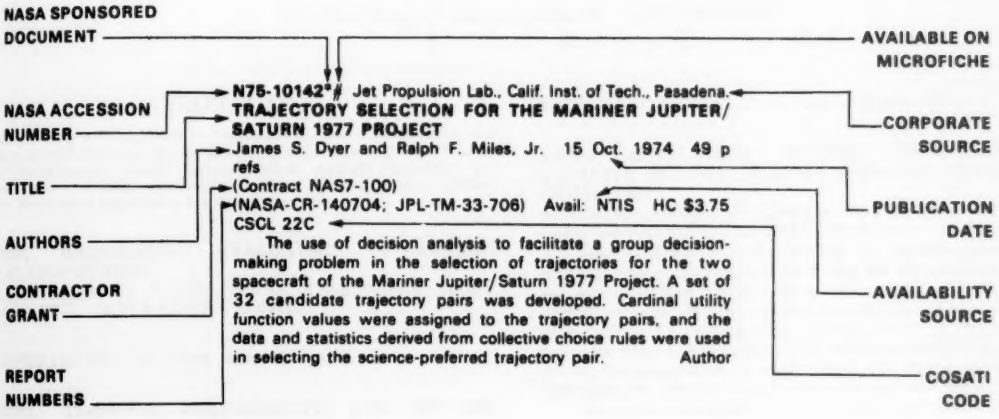
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TRAJECTORY SELECTION FOR THE MARINER JUPITER/ SATURN 1977 PROJECT
James S. Dyer and Ralph F. Miles, Jr. 15 Oct. 1974 49 p refs
TITLE
PUBLICATION DATE
(Contract NAS7-100)
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75
AUTHORS
CSCL 22C
CONTRACT OR GRANT
AVAILABILITY SOURCE
The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author
REPORT NUMBERS
COSATI CODE

ON-GOING RESEARCH PROJECTS

This is a listing of research projects—not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, ENGINEERING EVALUATION OF ROCKET ELECTROPHONESIS
M. BIER, Univ. of Arizona, School of Agriculture, *Tucson, Arizona* 85721 (NAS 8-31537; 179-42-20)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0002, TERMINAL REQUIREMENTS FOR JET AIRCRAFT
R. HORONJEFF, Univ. of California, Inst. of Trans. & Traf. Engin., *Berkeley, California* 94720 (111017 (HRB NO.))

This study is directed toward a series of airport design and operating problems that will be posed by the introduction of enlarged versions of present jet aircraft, particularly aircraft parking and passenger loading and unloading. This study is directed toward determining the arrival and loading rates of passengers and the utilization of aircraft parking positions during peak periods. Reports issued: A look at air cargo and space requirements for airline freight terminals, H. O. Brown. A look at the factors which affect gate requirements at airports, J. W. Edwards. Passenger enplaning and deplaning characteristics, E. T. Kaneko. Passenger flow at departure lounges, R. L. Paulin. A queueing model for departure baggage handling at airports, J. H. Tanner. A look at scheduled air carrier operations relating to terminal requirements, R. T. Uhl. Utilization of gate positions at metropolitan airports, Ph.D. thesis, G. A. Steuart. Runway utilization as affected by airplane acceleration during take-off, R. D. Forrest. A simulation of an airport runway system, J. M. Chavkin and R. H. Fowler. Operation of long wheel base aircraft on taxiway curves, R. W. Mink. A model to investigate the separation of landing aircraft with special reference to collision risk, Ph.D. thesis, S. L. M. Hockaday. A model of the airfield surface system, Ph.D. Thesis, D. Maddison. A look at airplane arrival and departure maneuvering times in the gate and apron area, H. Van Wyen. A preliminary investigation into the taxiway congestion problem, J.R. Tucker and W.E. Huggett. A study of processing characteristics for departing international airline passengers, Edward M. Kelly. Beacon code assignment schemes for air carrier aircraft, H. Van Duyne. A multiple linear regression analysis of intercity air passenger travel to San Francisco and to Los Angeles, Donald A. Schroeder. A study of the departure process at the San Francisco International Airport, A. R. Hammond. Alternative approaches for scheduling of air carriers at high density airports, M. D. Zywokarte. Moving sidewalk systems at airport terminals, C. J. Hoch. Transportation pricing: effects, theories and evaluation, M. M. Yoshikami. (Text Abridged)

SUPPORTED BY No Formal Support Reported

1.0003, AIRCRAFT INTERIOR COMPOSITE PANELS
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *Chico, California* 95927 (NCA 2-10504; 505-08-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0004, SIMULATION STUDIES OF INCREASED CAPACITY RUNWAY/TAXIWAY TERMINAL APRON CONFIGURATION
UNKNOWN, McDonnell Douglas Corporation, *Long Beach, California* 90808 (045325 (TRAIS NO.))

The contractor shall develop a capacity determining technique for measuring and predicting the capacity, delay queuing, etc. of airport airside surface movements and consider unit aircraft movements from a position on the arrival airspace to the gate position on parking area and from there to departure airspace for basic configurations. The technique shall be designed to permit the recognition of critical areas and factors effecting aircraft ground operations and help to solve problem areas.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0005, AIR TRANSPORTATION ACTIVITY
J.M. ENGLISH, Univ. of California, School of Engin. & Appl. Sci., *Los Angeles, California* 90024 (036832 (TRAIS NO.))

Conduct a study to predict the level of activity of air transportation in the lower stratosphere in the year 1990.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0006, MODELING FOR JET NOISE
J. LAUFER, Univ. of Southern California, School of Engineering, *Los Angeles, California* 90007 (011950 (TRAIS NO.))

Develop engineering guidelines for the noise abatement of subsonic and supersonic jets. The program of basic research will be conducted over a period of three years. The first year's activity will include: a) the overall design and construction of the research facility: the anechoic chamber, the air supply system for the jet, the jet nozzle, the traversing mechanisms used for detailed measurements: b) development of special narrow angle microphones of electronic system for data processing: and c) preliminary measurements in a high subsonic clean jet. In the second year plans are laid out to conclude the clean jet experiments and to initiate the theoretical study of a source model.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0007, A STUDY OF HIGH-ALTITUDE WAKE DYNAMICS
HOSHIZAKI, Lockheed Aircraft Corporation, *Palo Alto, California* 94304 (025266 (TRAIS NO.))

The contractor will (1) develop a model for the chemically reacting wake of an aircraft flying at subsonic or supersonic velocity in the stratosphere or upper troposphere in order to predict changes occurring in engine exhaust products in the aircraft wake, and (2) make selected calculations using the developed model. The project is part of the DOT's High-Altitude Aircraft Climatic Impact Assessment Program.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0008, DOMESTIC AND INTERNATIONAL IMPLEMENTATION AND EVOLUTION OF AREA NAVIGATION
UNKNOWN, Systems Control Incorporated, *Palo Alto, California* 94306 (036304 (TRAIS NO.))

A series of studies to support the FAA in planning, analyzing, executing and monitoring selected areas affecting the domestic and international implementation and evolution of area navigation.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0009, IMPROVING UTILIZATION AND EFFICIENCY OF PANEL FLUTTER
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75513; 505-02-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0010, CIAP-MEASUREMENTS/DEVELOPMENT OF NO(SUB)X MONITORS
W.N. HESS, U.S. Dept. of Commerce, Natl. Oceanic & Atmos. Admin., *Boulder, Colorado* 80302 (036851 (TRAIS NO.))

Develop and fabricate nitric oxide measurement systems instrumentation for balloon and aircraft operation in support of CIAP.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0011, DESIGN OF NONINTERACTING FLIGHT CONTROL SYSTEMS IN THE PRESENCE OF LARGE PARAMETER VARIATIONS AND DISTURBANCES
S.H. WANG, Univ. of Colorado, School of Engin. & Appl. Sci., *Boulder, Colorado* (NSG 1213; 512-53-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0012, FIREFIGHTER TRAINING EFFECTIVENESS
B.E. DALLMAN, U.S. Air Force, Human Resources Laboratory, *Denver, Colorado* 80230 (DF221710)

Firefighter training has traditionally relied on realistic training exercises using actual fires. Devices exist which can produce training fires having virtually no smoke associated with them. The objective of this study is to determine whether training under smoke-abated conditions produces any decrement in overall training program effectiveness. This determination will be limited to simulated aircraft crash fires. This work is being accomplished in direct response to a letter request (29 Jan 74) from the Air Force Civil Engineering Center, Tyndall AFB, Oklahoma.

Students trained in the conventional manner will be compared with students trained under smoke-abated conditions to see if there are differences in firefighting performance during a simulated full-smoke aircraft crash fire. Performance data will consist of time to extinguish the fire and correctness of procedures. In addition, opinion data will be collected from instructors and students to determine whether smoke- abated training is perceived as acceptable.

Supporting agency address information: AF Human Resources Laboratory TTT, Lowry AFB, Colorado 80230

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0013, SIGNAL LIGHTING
R.L. BOOKER, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (2211511)

Objective: To provide technical support to government agencies, industry, and the public on all aspects of visual signalling related to transportation. To increase the level of visual signalling expertise in these groups through the provision of tutorial publications, technical colloquia, and consultative services.

Approach: Conduct experimental investigations to develop new measurement techniques, evaluate visual signalling systems and components, and determine optical characteristics of sources, filters, and other optical materials. Provide training in visual signalling through publication of handbooks, monographs, NBS reports, and test reports; by conducting technical colloquia; and through consultation with technical representatives of sponsoring agencies and others. Promote national and international standardization of visual signalling practice through representation on committees (CIE, ICAO, SAE, IES) and consultation with sponsors.

Progress: Completed investigation and report of in-service chromaticity limits for obstruction marker paint, with recommendation for color-tolerance charts. Completed eight of the nine chapters of the monograph on runway visual range. Developed photometric focussing procedure for optical glide path indicator, issued report and recommendations for design changes. Issued test reports on hazard beacon and edge, centerline, and perimeter lights used during landings on aircraft carriers. Conducted seven sessions of NBS Colloquium on Airport Lighting for FAA, Navy, and Air Force personnel. Conducted study of improved simulation of visual aids. Initiated effort to test suitability of established methods of haze measurement for auto windshield evaluation. Furnished consultative and advisory services to sponsors and the general public.

The integrated visibility meter task was transferred completely to Division 446. The Handbook 95 revision and specification of colors of light signals were tabled by higher priorities. Color Recognition of Flashing Lights will be postponed pending necessary personnel and financial support.

Addenda: This project is also supported by Navy and DOT.

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

1.0014, MODIFY RB-57F AIRCRAFT (CIAP)
E.B. GILLER, U.S. Energy Res. & Dev. Admin., Div. of Military Applications, *Washington, District of Columbia* 20545 (036874 (TRAIS NO.))

Modify RE-57Fs aircraft with instrumentation to record air temperature, pressure, altitude, etc., suitable for CIAP data reduction and analysis. Coordination requirements for placement of CIAP instrumentation testing, calibration, data recording, and measurements, etc. Particulate studies and related experiments.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0015, RE-USE PLANNING OF TRANSPORTATION PROPERTY ABANDONMENTS
K.J. DUCKER, Univ. of Iowa, Graduate School, *Iowa City, Iowa* 52240 (045967 (HRB NO.))

The purpose is to develop an operational planning paradigm which coordinates considerations of re-use potential with the more immediate aspects of transportation property abandonments and to facilitate the concerted pursuit of efficient resource allocation and environmental quality in the abandonment context. The scope calls for a comprehensive and coordinated examination of all potential impacts of abandonment, stressing the systematic analysis of re-use potential and the integration of that analysis into existing institutional procedures for abandonment decisions. A multimodal perspective would be realized, embracing aviation airports. Principal techniques include substantive legal research, systems analysis of re-use demand and market areas, and prototype test applications in cooperation with state agencies in Iowa.

Document provided to S.S.I.E. by the R.R.I.S.

SUPPORTED BY U.S. Dept. of Transportation - S.D.T.

1.0016, STRUCTURAL ANALYSES OF ULTRA-HIGH SPEED AIRCRAFT STRUCTURAL COMPONENTS
K.H. LENZEN, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NSG 4006; 505-02-23)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0017, DEFINITION OF REQUIREMENTS FOR GENERAL AVIATION DRAG REDUCTION RESEARCH
J. ROSKAM, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NSG 1175; 505-10-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0018, MODIFICATION AND TESTING OF A REMOTELY AUGMENTED VEHICLE SYSTEM
J. ROSKAM, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NSG 4007; 501-33-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0019, ANALYTICAL MODEL FOR SEPARATED FLOW ON WINGS
G.W. ZUMWALT, Wichita State University, School of Engineering, *Wichita, Kansas* 67208 (NSG 1192; 501-06-05)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0020, GROUND MONITORING OF AIRCRAFT
UNKNOWN, Westinghouse Electric Corp., *Baltimore, Maryland* 21227 (025315 (TRAIS NO.))

Performance monitoring of final approach, touchdown and rollout. The program calls for development of a system for ground monitoring of aircraft to provide a data base for computer analysis of all traffic landing at a major civil airport.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0021, BLUNT BODY DYNAMIC STABILITY
A. MORRISON, U.S. Navy, Aerodynamics Department, *Silver Spring, Maryland* 20910 (DN585231)

To compile useful information obtained from current literature and systematic wind-tunnel tests which may be used to predict the static- and dynamic-stability derivatives of free-fall blunt bodies of fineness ratio of 10 or less having low-aspect ratio stabilizing surfaces in the Mach range of 0.2 to 2.0.

A literature search will be made of the current literature and available test data. A survey will also be made of the available analytic methods for the theoretical and empirical prediction of the pitch-damping forces and moments. These methods will then be modified as needed to account for bluntness effects and noncircularity of cross section. The available data will then be compiled to isolate effects due to nose bluntness, nose length, centerbody length, stabilizer type, area and aspect ratio.

Supporting agency address information: Naval Air Systems Command AIR-320C, Washington, D. C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0022, OPTIMAL AERODYNAMIC SHAPES
J.M. SOLOMON, U.S. Navy, Mathematical Analysis Div., *Silver Spring, Maryland* 20910 (DN585226)

To develop efficient and reliable computational algorithms for determining optimal aerodynamic shapes. Initially, the work will be directed toward determining shapes with minimum pressure drag subject to the following conditions - the bodies will be two-dimensional airfoils (or bodies of revolution) in steady supersonic flight with (1) given length and thickness or (2) given length and enclosed area (or volume). Another objective of this research is to develop efficient methods for controlling solidification and melting processes.

In the present investigation, three basically different approaches will be explored. The relative merits of each will be assessed for the present class of problems. The approaches to be used are - (1) determine necessary (and possibly sufficient) conditions for optimality which lead to constructive methods- (2) reduce the optimal control problem for partial differential equations to an equivalent problem involving variational inequalities and use theoretical and numerical methods available for such inequalities to develop computational algorithms, (3) adapt direct methods for numerical solution of optimal control problems involving ordinary differential equations to the present problems.

Supporting agency address information: Naval Air Systems Command NAIR-310, Jefferson Plaza, Number 1, Arlington, Va. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0023, VTS SIMULATION/SIMULATOR FACILITY
E.L. BITTLE, U.S. Air Force, Electronic System Division, *Bedford, Massachusetts* 21730 (048950 (TRAIS NO.))

MITRE Corporation proposal dated 5 April 1974 for the preparation of an integrated facility description and acquisition plan for a VTS simulation/simulator facility and determine the application of Air Traffic Control models as a simulation tool.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Coast Guard

1.0024, AIRPORT SURFACE TRAFFIC CONTROL SYSTEMS
UNKNOWN, U.S. Air Force, *Bedford, Massachusetts* (045993 (TRAIS NO.))

The contractor shall provide engineering support to the development of a new Airport Surface Detection Equipment (ASDE-3) by a) completing the ASDE-3 equipment specifications; b) completing the formulation of evaluation criteria and scoring sheets for ASDE-3 proposal; and c) providing technical assistance in the evaluation of contractor proposals. The contractor shall provide the engineering support necessary to produce a specification for a Bright Display based on an ITT design provided by TSC. The contractor shall generate specifications for background suppression and boundary enhancement equipment, based on analog radar mapping techniques.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0025, ENGINEERING SUPPORT TO FAA V/STOL SPECIAL PROJECTS OFFICE/CAMBRIDGE, MASS
UNKNOWN, Urban Sys. Res. & Engin. Inc., *Cambridge, Massachusetts* 02138 (025237 (TRAIS NO.))

Engineering Services to define, establish and support a systems planning function for the FAA Quiet Short-Haul Air Transportation Systems Office.

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SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0026, EFFECTS OF HETEROGENOUS TRAFFIC INFORMATION DISPLAY
UNKNOWN, Tufts University, Graduate School, *Medford, Massachusetts* 02155 (NCA 2-85601; 504-09-33)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0027, AIRCRAFT WAKE VORTEX BEHAVIOR STUDY
UNKNOWN, Raytheon Company, *Sudbury, Massachusetts* 01776 (045746 (TRAIS NO.))

The Contractor shall furnish the necessary personnel, facilities, services, and materials to accomplish the work set forth below: 1. Examine the accuracy with which existing theoretical models can predict vortex behavior and to determine the significance of meteorological and aircraft conditions and vortex age on the resultant average drift velocities. 2. Assess the impact of meteorology on vortex transport and decay. 3. Determine analytically whether any vortex parameters might be detected by a moving aircraft (this should also include just the detection of the existence of a vortex in the flight-path). 4. Perform an analysis to determine the significance of vortex drift as a function of runway geometry and usage by considering such information as the runway separation, displacement of thresholds, etc.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0028, VOLUMETRIC COVERAGE STUDY IN SUPPORT OF THE AIR TRAFFIC CONTROL RADAR BEACON SYSTEM
UNKNOWN, Univ. of Michigan, Graduate School, *Ann Arbor, Michigan* 48104 (045889 (TRAIS NO.))

1. Investigate the effects of horizontal and vertical displacement of current omni and directional ATCRBS antennas on the Interrogate Side Lobe Suppression (ISLS) and the Improved Interrogate Side Lobe Suppression (I2SLS) operation of the ATC beacon system. 2. Investigate the effects of horizontal and vertical displacement of improved omni and directional ATCRBS antennas on ISLS and I2SLS system operation. 3. Investigate the effects of the use of difference patterns, rather than omnidirectional patterns, on the ISLS and I2SLS system operation. 4. Explore alternative antenna designs and locations for achieving interference-free ISLS and I2SLS system operation.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0029, IMPACT OF AIRPORT EMISSIONS ON AIR QUALITY
R.B. EVANS, U.S. Environ. Protection Agcy., Natl. Environ. Research Center, *Las Vegas, Nevada* 89114 (1AA009)

Objectives: Develop procedures for assessing impact of air quality on or near airports from changes in airport emissions, e.g., aircraft, auxiliary equipment and associated ground transportation.

Approach: Collect aerial and ground-level air pollutant and meteorological data in the vicinity of selected airports, and utilize mathematical modeling to describe airport emissions and emission fate.

Current Plans/Progress: Aircraft emissions study complete at Atlanta International Airport; military airfield study planning initiated.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

1.0030, ADVANCED AGTC SYSTEM CONCEPT FORMULATION (AIRPORT GROUND TRAFFIC CONTROL)
W. HEISER, Computer Sciences Corporation, *Paramus, New Jersey* 07652 (082264 (HRB NO.))

The Systems Division of Computer Sciences Corporation is leading a team (Gulf & Western, Texas Instruments, and Trans World Airlines) in a Concept Formulation Study for the Transportation Systems Center (DOT) for an advanced Airport Ground Traffic Control (AGTC) System. Based on an operations analysis of a baseline airport (O'Hare Airport), the team defined an effectiveness assessment methodology for evaluating current and future AGTG systems. Parametric relationships and detailed vehicle and controller functional requirements were developed for definition of AGTC system functional modules and their interfaces, including man- machine. A methodology for estimating system configurations and mechanization of AGTC functions is being developed, which should lead to potential deployment analyses and system configuration estimates for selected airports.

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0031, IN-FLIGHT EVALUATION OF DECOUPLER LONGITUDINAL CONTROLS FOR A STOL TRANSPORT AIRCRAFT
E. SOCKEL, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (NAS 1-13502; 512-53-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0032, STATISTICAL ANALYSIS AND MODELING OF AIR TRAFFIC CONTROL PERFORMANCE MEASURES
UNKNOWN, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (036319 (TRAIS NO.))

The study will be addressed to the statistical analysis and modeling of Air Traffic Control (ATC) system performance measures. The Federal Aviation Administration (FAA) National Aviation Facilities Experimental Center (NAFEC) has collected ATC voice communications and activity data from a number of operational facilities and reduced these data into histograms and frequency distributions. These data will provide the basic data base for which the statistical analysis and modeling are required.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0033, A CASE STUDY OF THE NEW YORK-ALBANY CORRIDOR - THE COST OF FEASIBLE IMPROVEMENTS AND THEIR EFFECT ON MODAL SPLIT
L.J. PIGNATARO, Polytechnic Inst. of New York, School of Engineering, *Brooklyn, New York* 11201 (100421 (HRB NO.))

A study of the relative costs and efficiencies of the various intercity passenger transport modes operating in the New York-Albany corridor is underway. Unit cost models have been prepared for existing modes as part of the first year's effort. Second year activities include investigations of potential high-speed rail improvements and the feasibility of STOL/VTOL service in the corridor. A corridor model is also being prepared.

Document provided to S.S.I.E. by the H.R.I.S.

Addenda: This project is also supported by: New York State Science and Technology Foundation.

SUPPORTED BY Polytechnic Inst. of New York - Brooklyn

1.0034, MICROWAVE LANDING SYSTEM, GREENLAWN, NEW YORK
H. REDLIENER, Hazeltine Corporation, *Greenlawn, New York* 11740 (025171 (TRAIS NO.))

This project is a concurrent series of supporting government programs, to be undertaken by DOT, DOD, NASA, which will include validation efforts independent of the industry program, investigations of sub-system concepts, and techniques, performance of flight test and system evaluation efforts, and application of the microwave guidance system to the requirements of the individual users. Special emphasis is placed on the need for expeditious development of a MLS basic design that will utilize a standard signal structure and feature highly flexible modular building-block concepts that will facilitate its being approximately configured to meet the complex requirements for full-scale all-weather automatic landings.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0035, DEVELOPMENT OF FLEXIBLE ROTOR BALANCING CRITERIA
N.F. RIEGER, Rochester Inst. of Technology, School of Engineering, *Rochester, New York* 14608 (NSG 3072)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0036, TIME COURSE OF VISUAL INFORMATION TRANSFER DURING AIRCRAFT CONTROL PROBLEMS
J.L. BROWN, Univ. of Rochester, School of Arts & Sciences, *Rochester, New York* 14627 (NSG 1211; 723-01-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0037, VISUAL DETECTION SIMULATOR
UNKNOWN, Questek Incorporated, *Roslyn, New York* 11576 (038699 (TRAIS NO.))

The proposed contract will provide for the construction of a visual detection simulator and the performance of detection experiments in support of a determination of the human factors involved in pilot warning instrument (PWI) systems. The establishment of national standards for PWI requires the determination of system specifications which in turn consist of a combination of equipment parameters and human factors. The results of this human factors experimentation, which should be accomplished early in the fiscal year 1974, complements the current PWI equipment program concurrently being developed at this center.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0038, DEVELOP AND TEST ILS MONITOR PRECISION CALIBRATORS
UNKNOWN, Cardion Electronics Inc., *Woodbury, New York* 11797 (024748 (TRAIS NO.))

Design, develop, and test 6 ILS Monitor Precision Calibrators. Furnish production specifications and provide instruction books.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0039, RESEARCH PROGRAM IN AEROACOUSTICS FOR NOISE CONTROL OF GENERAL AVIATION AIRCRAFT
F.D. HART, Univ. of North Carolina, School of Engineering, *Raleigh, North Carolina* 27600 (NSG 1205; 505-90-82)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0040, ANALYSIS AND EXPERIMENTATION OF CORE ENGINE NOISE CONTROLS PROPULSION SYSTEMS FOR FUTURE TECHNOLOGY AIRCRAFT
UNKNOWN, General Electric Company, *Cincinnati, Ohio* 45215 (036310 (TRAIS NO.))

Conduct a program of analysis and experimentation of core engine noise controls of propulsion systems for future technology aircraft (i.e., conventional (CTOL), short takeoff (STOL), and vertical takeoff or landing (VTOL) subsonic aircraft) for which type certification applications have not yet been made.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0041, WEAPON DETECTION ON AIRLINE PASSENGERS
UNKNOWN, Westinghouse Electric Corp., *Pittsburgh, Pennsylvania* 15235 (038181 (TRAIS NO.))

The contractor shall furnish all the necessary personnel, material, facilities except as provided herein, equipment and services to establish the feasibility of a concept to detect handguns in airline passenger baggage and ladies' purses.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0042, ADVANCED MATERIALS APPLIED TO GUIDEWAYS, HIGHWAYS, AND AIRPORT RUNWAYS
D.M. ROY, Penn. State University, Materials Research Laboratory, *University Park, Pennsylvania* 16802 (045961 (HRB NO.))

The potential of advanced technology is being demonstrated for ceramic materials in high usage vehicular traffic areas. The emphasis is on finding a solution to materials problems in guideways or special sections of highways and airport runways, where the performance requirements are high and complex, and where the cost of materials will be balanced against repairs and safety factors. The evaluation will test the concept of using nonmetallic wear-resistant materials and will include recommendations for future developments.

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY U.S. Dept. of Transportation - S.D.T.

1.0043, ADVANCED TECHNOLOGY MATERIALS APPLIED TO GUIDEWAYS, HIGHWAYS AND AIRPORT RUNWAYS
D.M. ROY, Penn. State University, School of Earth & Min. Sci., *University Park, Pennsylvania* 16802 (045961 (TRAIS NO.))

The objective of this research is to demonstrate in a very rapid preliminary way the possibility of doubling the lifetime of heavily used guideways utilizing known materials and concepts.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0044, MICROWAVE LANDING SYSTEM
L.M. LOCKERD, Texas Instruments Incorporated, *Dallas, Texas* 75222 (045422 (TRAIS NO.))

This project is a concurrent series of supporting Government Programs, to be undertaken by DOT, DOD, and NASA, which will include validation efforts independent of the industry program, investigations of sub-system concepts and techniques, performance on flight test and system evaluation efforts, and application of the microwave guidance system to the requirements of the individual users. Special emphasis is placed on the need for expeditious development of a MLS basic design that will utilize a standard signal structure and feature highly flexible modular building-block concepts that will facilitate its being approximately configured to meet the complex requirements for full-scale all-weather automatic landings.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0045, STUDY OF INTERIOR AIRCRAFT CABIN NOISE
I.D. JACOBSON, Univ. of Virginia, School of Engin. & Appl. Sci., *Charlottesville, Virginia* 22903 (NSG 1180; 504-09-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0046, COSTS-BENEFITS ANALYSIS OF INSTRUMENT VERSUS MICROWAVE LANDING SYSTEMS
J. SHEWAR, Computer Sciences Corporation, *Falls Church, Virginia* 22046 (082265 (HRB NO.))

CSC is performing a costs-benefits analysis for determining the optimum benefit-to-cost relationship to the United States, and especially to the users, of 1) augmenting the conventional Instrument Landing System (ILS), or 2) replacing the ILS with the Microwave Landing System (MLS). The analysis considers both tangible and intangible benefits of MLS and alternatives, and methodology for qualifying benefits, for both civil and military users, including: runway spacing, V/STOL activity; siting, curved approaches and operational performance categories of ICAO - Appendix 10, Operational impacts considered include ground facilities, aircraft equipment, pilot and operator skill levels, technical performance abilities, concurrent support development and economic factors.

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0047, DEVELOPING A TOTAL INTEGRATED COMMUNICATION SYSTEM PLAN
UNKNOWN, Computer Sciences Corporation, *Falls Church, Virginia* 22046 (036314 (TRAIS NO.))

Develop a totally integrated communications system plan. The studies, which will be required at various times during a twelve-month period, will cover short- and long-term system design, roles of air/ground voice and data links, of the present and future automated voice and data ground networks, implementation implications and overall costs.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0048, FORMULATION OF A DESIGN AND SPECIFICATION OF AN ADVANCED AIRPORT GOUND TRAFFIC CONTROL (AGTC) SYSTEM CONCEPT
UNKNOWN, Computer Sciences Corporation, *Falls Church, Virginia* 22046 (045713 (TRAIS NO.))

Provide system engineering support to TSC by obtaining, analyzing and providing data to be used by TSC in an advanced system concept formulation, and in the preparation of system module specifications. The contractor will have available the results of a preliminary deployment- potential analysis, preliminary surveillance-system analysis and preliminary DABS-based AGTC system definition. In addition to the three studies, the contractor will require detailed information on the operation of an AGTC System. This information will be provided through the detailed study of a specific baseline airport to be selected by the Government. This study will be done as a part of this contract.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, MARV NOSE-TIP ANALYSIS CODE MODIFICATION, DELIVERY, AND OPERATIONAL CHECKOUT
M. SHERMAN, Prototype Dev. Assoc. Inc., *Santa Ana, California* 92705 (DN585290; N60921-75-C-0143)

The objective of this effort will be to develop the in-house capability to perform coupled analysis of the heat-transfer rates, shape change, in-depth conduction, and particle erosion effects on nose tips of maneuvering re-entry vehicles at angles of attack up to 25 degrees. This work unit summary supports Agency Accession No. DN585071.

Existing computer codes developed by the contractor for Univac 1108 operation will be converted for use on the White Oak Laboratory CDC 6500 computer, a users' manual will be prepared, and the contractor will provide on-site installation and operational checkout of the codes at the White Oak Laboratory Computing Facility.

Supporting agency address information: Naval Surface Wpns Cen, W.O. Lab, Ballistics Department, Silver Spring, Md. 20910

SUPPORTED BY U.S. Dept. of Defense - Navy

2.0002, ANALYSIS OF THE SPACE SHUTTLE DECISION
UNKNOWN, George Washington University, Graduate School, *Washington, District of Columbia* 20006 (NSG 7145; 010-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0003, DYNAMICS OF SPIN STABILIZED SPACECRAFT WITH MOVABLE APPENDAGES
P.M. BAINUM, Howard University, School of Engineering, *Washington, District of Columbia* 20001 (NSG 1181; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0004, EXPERIMENT DEFINITION USING THE SPACE LABORATORY LONG DURATION EXPOSURE FACILITY, AND SPACE TRANSPORTATION SYSTEM SHUTTLE
A.P. SHEPPARD, Georgia Inst. of Technology, School of Engineering, *Atlanta, Georgia* 30332 (NSG 1200; 975-50-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0005, STATE VECTOR UPDATE FILTER FOR AUTO-LAND PORTION OF THE SHUTTLE LANDING
G.S. GREWAL, Southern Univ. A. & M. College, School of Engineering, *Baton Rouge, Louisiana* 70813 (NSG 9030; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0006, APPLICATIONS OF SATELLITE TECHNOLOGY FOR REGIONAL ORGANIZATIONS
UNKNOWN, City University of New York, Graduate School, *New York, New York* 10031 (NSG 7144)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0007, INFLUENCE OF THE EXTERNAL PARAMETERS OF SPACE FLIGHT ON THE REGULATION OF BLOOD VOLUME
P.C. JOHNSON, Baylor University, School of Medicine, *Houston, Texas* 77025 (NAS 9-14662; 970-51-15)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0008, RENAL RESPONSE TO ACTUAL AND SIMULATED SPACE FLIGHT
W.N. SUKI, Baylor University, School of Medicine, *Houston, Texas* 77025 (NAS 9-14715; 970-51-16)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0009, SPACE TECHOLOGY RESEARCH PLANNING STUDY
G.L. GOGLIA, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1186; 750-01-10)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, ATMOSPHERIC RADIOCHEMISTRY
P.K. KURODA, Univ. of Arkansas, Graduate School, *Fayetteville, Arkansas* 72701 (BER-76-43; E(40-1)2529)

The objective of this research is to learn more about the behaviors and movements of radioactive fallout particles in the atmosphere. Radioactive isotopes injected into the atmosphere by the nuclear test explosions can be used as tracers in the studies of the movement of air masses, and also many other meteorological phenomena. The levels of various radioactive isotopes in rain, snow and ground-level air are being measured at Fayetteville (36 degrees N, 94 degrees W), Arkansas; for example, Sr89, Sr90, Ba140, Ce141, Ce144. A systematic study on the long-lived radon daughters in the atmosphere is also being continued. The variations of the short-lived thoron decay product, lead-212, are being measured in single rainstorms. The pattern of variation of radioisotope ratios and stable tracers are also being investigated within the single rainfalls. The long-range air trajectory studies on the nuclear debris circling the earth at 300 mb and 500 mb levels are being continued along with the study of the daily fluctuations and individual radioactive hot particles in the atmosphere. Experiments on the levels of plutonium isotopes in the atmospheric precipitations and air samples are being carried out.

SUPPORTED BY U.S. Energy Res. & Dev. Admin. - B.E.R.D.

3.0002, STUDY OF THE THERMAL DEGRADATION OF POLYMERS UNDER LASER SIMULATED ENVIRONMENTS
R.B. WILLIAMSON, Univ. of California, School of Engineering, *Berkeley, California* 94720 (NSG 2084; 505-01-32)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0003, LOW DENSITY EXPERIMENTAL THRESHOLD DETERMINATION
UNKNOWN, Univ. of California, Graduate School, *Davis, California* 95616 (NCA-2-80503; 185-50-60)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0004, FUNDAMENTAL MATERIALS STUDIES DIRECTED AT IMPROVING THE EFFICIENCIES OF III-V HETEROJUNCTION SOLAR CELLS
G.L. PEARSON, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 1201; 506-18-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0005, CHEMICAL VAPOR DEPOSITION OF HIGH TO SUPERCONDUCTORS
G.W. WEBB, Univ. of California, Graduate School, *San Diego, California* 92038 (NSG 3055; 506-25-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0006, FORMATION OF ORGANIC MICROSTRUCTURES FROM SIMPLE PREBIOTIC COMPOUNDS
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Francisco, California* 94132 (NCA 2-60506; 192-55-61)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0007, ASSESSMENT OF TOXIC THREAT
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75521; 501-21-22)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0008, THE CHEMISTRY OF XENON DIFLUORIDE (XEF2)
S.A. SHACKELFORD, U.S. Air Force, Frank J. Seiler Res. Lab., *Colorado Springs, Colorado* 80840 (DF281590)

AF function - rocket propulsion, weapons, conventional and high explosives, lasers. Deficiency - existing technology is inadequate to support future AF needs for energetic fluorine containing binders and plasticizers and for solid fuel fluorine generators. Research - the chemistry and reaction mechanisms of XeF2. How research contributes - xenon difluoride is a potentially useful reagent for effecting fluorination of energetic materials to give heretofore difficultly attainable or unattainable energetic binders and plasticizers. It is also potentially useful as a solid source of fluorine atoms for laser applications. Abstract - the reactions of XeF2 with organic substrates will be investigated. These include olefins, acetylenes, carbonyl functions, organic radicals and other organic nucleophiles.

Supporting agency address information: Frank J Seiler Research Lab NC, USAF Academy, Colo. 80840

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0009, SEAM WELDING EVALUATION
R.H. WITTMAN, Univ. of Denver, School of Engineering, *Denver, Colorado* 80210 (NAS 1-13817; 502-24-41)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0010, INCREASING ADHESION OF PARA-CYCLOPHANE POLYMERS TO EPOXY GLASS LAMINATE SURFACES
F. WEAVER, Morris Brown College, Undergraduate School, *Atlanta, Georgia* 30314 (NSG 8027; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0011, ELECTRONIC PROPERTIES OF DISORDERED SYSTEMS 12460-P
D.M. ESTERLING, Indiana University, School of Arts & Sciences, *Bloomington, Indiana* 47401 (DA0K5579; DAHC04-75-G-0146)

To investigate certain theoretical techniques for disordered systems in an attempt to arrive at a predictive understanding of (1) anomalous changes in the effective mass of electrons upon alloying, (2) anomalous properties of titanium alloys and in particular the omega- phase, and (3) the negative magnetoresistance observed in a wide spectrum of heavily doped semiconductors. This research is relevant to a variety of transport properties of disordered alloys. Specifically, there are several programs at AMMRC which are concerned with the omega- phase and the diffusion of alloying elements in titanium. Certain titanium alloys are susceptible to embrittlement and cracking when the omega-phase is present. A theoretical model of the omega-phase is needed. This proposal contains a new approach to theoretically describe the omega-phase, and is hence relevant to the Army R&D effort to improve a number of important titanium alloys, which are used for mortar base plates, aircraft, and personnel armor.

The coherent potential approximation, particularly as generalized to off-diagonal randomness, will provide a common approach to these problems in disordered systems.

Supporting agency address information: AMC Army Research Office, Box 12211, Research Triangle Park, N. C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

3.0012, METEORITE CONTRIBUTION TO THE CHEMISTRY OF ORGANOGENIC ELEMENTS
UNKNOWN, Indiana University, Graduate School, *Bloomington, Indiana* 47401 (NCA 2-35501; 388-10-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0013, EFFECT OF MICROSTRUCTURE AND STRAIN RATE ON THE FRACTURE OF NEAR-ALPHA TI-ALLOYS
T.B. COX, U.S. Navy, Materials Department, *Annapolis, Maryland* 21402 (DN678007)

Investigate the microstructural aspects and strain rate effects associated with fracture in near-alpha titanium in order to suggest means of improving their resistance to fracture.

Determine the microstructural aspects of the fracture process in the near-alpha Ti-6Al-2CB-1TA-0.8Mo using extensive investigation of fracture surfaces coupled with metallographic observations from specimens sectioned after straining short of fracture. The effects of strain rate will be studied by fracturing charpy specimens by impact and under controlled rates of bending. Two different microstructures, a beta processed and an alpha-beta processed, will be investigated in an attempt to explain the large differences in toughness and ductility observed for these two processes. Various specimen geometries will be used to vary the level of stress triaxiality in an effort to explain the effects of constraint on the fracture process.

Supporting agency address information: Office of Naval Research R471, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0014, ENERGY TRANSFER BETWEEN LATTICE AND MOLECULE
P.D. YEDINAK, Western Maryland College, Undergraduate School, *Westminster, Maryland* 21157 (DA0J4539; DAAD05-73-C-0530)

It is necessary to provide a theoretical model on the microscopic level for understanding how chemical reactions occur in an explosive or propellant crystal in order to predict their sensitivities and to suggest new compounds.

An effort to understand how chemical reactions occur in an explosive or propellant crystal by applying the microscopic principles of solid-state physics and chemistry is in progress. The purpose of this approach is to yield information of the sensitivity of explosive and propellant crystals.

Supporting agency address information: AMC Ballistic Res Labs, Applied Math Lab, Aberdeen PG Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0015, UNIFORM DISPERSIONS OF CRYSTALLIZATION PROCESSING
D.R. UHLMANN, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NAS 8-31350; 179-42-20)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0016, INVESTIGATION OF IMPURITIES IN MAGNESIUM FLUORIDE
UNKNOWN, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (NAS 5-22482; 188-78-56)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0017, STUDY OF THE STRESS SENSITIVITY OF THE COERCIVE FORCE OF MICRON-SIZED EAFERRITE AND BIMN PARTICLES
K. SCHRODER, Syracuse University, Graduate School, *Syracuse, New York* 13210 (NSG 1194; 506-90-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0018, RESEARCH PROGRAM ON THE CHARGE TRANSFER EXCITED STATES OF TRANSITION METAL COMPLEXES
K.K. CHATTERJEE, Elizabeth City State Univ., Undergraduate School, *Elizabeth City, North Carolina* 27909 (NSG 1179; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0019, STUDY OF THE TITANIUM DIOXIDE-GALLIUM ARSENIDE INTERFACE
M.A. LITTLEJOHN, Univ. of North Carolina, School of Engineering, *Raleigh, North Carolina* 27600 (NSG 1202; 506-18-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0020, TRACE CHEMICAL ANALYSIS METHODOLOGY
W.D. ROSS, Monsanto Research Corporation, *Dayton, Ohio* 45407 (DF215010; F33615-75-C-1130)

AF function - analytical methodology, detection and quantitation of trace substances in AF operations. Deficiency - need for qualitative and quantitative data on potential environmentally harmful substances generated by AF operations and for ultra-sensitive and selective methods for other significant AF trace analysis requirements. Research - investigation of new, more sensitive, more selective, more cost- effective, and more reliable analytical methods capable of providing timely quantitative data for specific chemical analyses of AF importance. How research contributes - provides methodology to obtain data for assessing the extent of AF pollution problems, for establishing safe and 'environmentally acceptable' operation conditions, and for preparing environmental impact statements for present and future AF systems and operations. Provides basic methodology for trace analysis of materials used in AF operations (e.g., wear metals in aircraft lubricating oil, identification of foreign matter in hydraulic fluids, etc.).

Supporting agency address information: Aerospace Research Laboratory LJ, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0021, FRACTURE PROBLEMS IN COMPOSITE MATERIALS
K. ARIN, Lehigh University, School of Engin. & Phys. Sci., *Bethlehem, Pennsylvania* 18015 (NSG 1178; 505-02-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0022, RESEARCH IN MATERIALS SCIENCES
A.J. HEEGER, Univ. of Pennsylvania, Graduate School, *Philadelphia, Pennsylvania* 19101 (DF041320; F44620-75-C-0069)

Basic research on materials which are used in DOD and Air Force infrared detectors, structural members, and electrical power handling systems is needed to enhance the capabilities and reduce the expense of these systems. This contract provides contributions in each of these areas. Infrared detectors may be limited by excess noise generated in the detector material. Part of the work in this area will attempt to identify the source of excess l/f noise in PbSnSe devices. Additional work will be carried out on the electronic structure and deep-level impurity states of IV-VI compounds of interest. Structural materials in systems are limited by their susceptibility to corrosion, oxidation, and stress corrosion cracking. This effort represents a comprehensive theoretical and experimental approach to the problem of understanding the chemical and physical properties of metallic surfaces and the reactions of various atoms and molecules with these surfaces. Field emission spectroscopy, u-v photoemission spectroscopy, field ion microscopy, and surface electromagnetic waves will be used to experimentally determine the state of the surface and the adsorbed atoms and molecules. The cost of present-day electrical conductors will most likely increase as world supplies diminish. This effort will investigate the possibility of synthesizing inexpensive graphite intercalated materials with room temperature conductivities comparable to those of copper.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0023, MATERIAL REMOVAL PHENOMENA IN CERAMICS FOR AIRCRAFT AND MISSILE APPLICATIONS
P.J. GIELISSE, Univ. of Rhode Island, School of Engineering, *Kingston, Rhode Island* 02881 (DN930028; N00019-73-C-0198)

To improve understanding and control of abrasive machining in order to improve strength and reliability of ceramics in stressed applications for aircraft and missiles.

Mostly single point but some multiple point grinding is being done on ceramic workpieces. Emphasis on the cutting element includes geometry, composition, velocity, environment, tool matrix, thermal properties and tool force. Emphasis on the workpieces includes characterization of the workpiece and swath, identification of the stock removal mechanism, and workpiece dynamics.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0024, STUDY OF STANDARD TEST SPECIMENS FOR ROD PEENING ALUMINUM ALLOYS
J.J. WERT, Vanderbilt University, School of Engineering, *Nashville, Tennessee* 37203 (NAS 8-31556; 966-40-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0025, FIBER REINFORCEMENT AND SURFACE PROTECTION OF SELECTED TITANIUM ALLOYS
C.R. HOUSKA, Virginia Polytechnic Institute, School of Engineering, *Blacksburg, Virginia* 24061 (NSG 1214; 502-37-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0026, INTERACTION OF HYDROGEN CHLORIDE WITH ALUMINA
J.P. WIGHTMAN, Virginia Polytechnic Institute, School of Arts & Sciences, *Blacksburg, Virginia* 24061 (NSG 1195; 506-21-30)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0027, CHEMISTRY OF THE SYSTEM - A12030(Q)-HO1.AQ
S.Y. TYREE, Coll. of William & Mary, School of Arts & Sciences, *Williamsburg, Virginia* 23185 (NSG 1204; 506-21-30)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0028, BRIDGE DECK DE-ICING CHEMICALS
J.A. WILLIAMS, State Dept. of Highways, *Olympia, Washington* 98501 (082579 (HRB NO.))

The objective of this project is to determine if there is a direct correlation between the extent of chloride ion penetration on the severity of bridge deck deterioration and to evaluate and recommend existing and new inspection techniques. Bridge with known deck deterioration problems will be examined by visual, mechanical, electric, magnetic and drilling detection methods in order to obtain data on delamination, reinforcing steel cover, corrosive environment and chloride ion intrusion values to establish rate of deterioration.

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SUPPORTED BY U.S. Dept. of Transportation - F.H.A.

3.0029, STUDY OF THE HR DIAGRAM TO FIND THE BOUNDARY LINE FOR EFFECTIVE HYDROGEN CONVECTION ZONES
E. BOHMVITENSE, Univ. of Washington, School of Arts & Sciences, *Seattle, Washington* 98105 (NAS 5-22379; 868-11-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, AIR POLLUTION CONTROL THEORY
M. CRAWFORD, Univ. of Alabama, School of Engineering, *Birmingham, Alabama* 35294

Description: The overwhelming majority of effort has been devoted to preparation of the manuscript for a textbook entitled 'Air Pollution Control Theory.' The intended purpose of this book is to enable undergraduate and graduate engineering students, as well as practicing engineers, to analyze and design various devices useful in gas cleaning, that is, in controlling air pollution by preventing emissions into the atmosphere. By following the methods presented in the book, it will be possible to make simple designs of various pollution-control devices. Such devices would probably not work well in practice, but this represents the missing theoretical approach to a subject which has up to now been dominated by empirical methods. One hopes that later work will bridge the gap between this simple theory and the practical results in the literature. The book is scheduled to be on the market in the spring of 1976. In addition a course also entitled 'Air Pollution Control Theory' has been taught on several occasions. Also, some preliminary work has been done toward designing laboratory equipment to study various air-pollution control devices.

Addenda: Estimated calendar year funding reported as 1973 $6,000, 1974 $15,000, 1975 $7,000.

SUPPORTED BY University of Alabama

4.0002, PROPELLANT ROCKET MOTORS
J.J. BURKE, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NCA 5-38; 188-38-53)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0003, RESEARCH TASK UNDER GSFC/UNIV OF ARIZONA MASTER AGREEMENT WORK STATEMENT NO. 8
H.W. EPPS, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NCA 5-39; 188-38-53)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0004, PIONEER/VENUS DESIGN AND DEVELOPMENT OF SOLAR FLUX RADIOMETER
M.G. TOMASKO, Univ. of Arizona, Lunar & Planetary Laboratory, *Tucson, Arizona* 85721 (NAS 2-8818; 825-20-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0005, RADIATIVE TRANSFER, HYDRODYNAMICS, AND IONIZATION MASS LOSS
UNKNOWN, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NCA 2-40601; 185-47-67)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0006, LASER DOPPLER VELOCIMETER
C.W. MILLER, Univ. of California, School of Engineering, *Berkeley, California* 94720 (ENG75-16591)

Funds are provided to assist with the purchase of a Laser Doppler Velocimeter system. The equipment will be primarily employed in flow velocity measurement in free convection heat transfer. The principal investigator has recently been awarded a research initiation grant by NSF to perform the heat transfer research, which has applications in solar energy storage. In addition, the equipment will also be used by others of the investigator's colleagues for the continuing research in fire, combustion, dynamics and erosion-corrosion research.

SUPPORTED BY U.S. Natl. Science Foundation

4.0007, RESEARCH ON METHODS OF OBTAINING ON-AXIS VELOCITY COMPONENT FOR A LASER VELOCIMETER
T.T. WOODSON, Claremont College, Undergraduate School, *Claremont, California* 91711 (NAS 2-8921; 514-52-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0008, AIRBORNE OIL SURVEILLANCE SYSTEM/AOSS
UNKNOWN, Aerojet General Corporation, *El Monte, California* 91734 (036083 (TRAIS NO.))

The detailed design, fabrication, installation, and flight test evaluation of a prototype airborne oil surveillance system/AOSS.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Coast Guard

4.0009, STUDY A NEW DRAG-FREE DENSITY INSTRUMENT REQUIRING NO PROPELLANT
D.B. DEBRA, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 1210; 384-47-9X)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0010, DEVELOPMENT OF A RESEARCH MODEL OF THE VERTICAL MOTION SIMULATOR
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45601; 997-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0011, MILLIMETER - WAVE INTERFEROMETRY
R.B. LEIGHTON, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NSG 7136; 196-41-82)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0012, INVESTIGATION AND DEVELOPMENT OF AN ELECTRONIC SYSTEM FOR THE MEASUREMENT OF ACTIVITY
G.T. CATALANO, Calif. State Univ. & Colleges, Graduate School, *San Francisco, California* 94132 (NCA 2-80411; 970-21-12)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0013, FIRE SUPPRESSION AND CONTROL SYSTEMS
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75601; 505-01-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0014, MODELING TERRAIN RELIEF EFFECTS ON STACK EFFLUENT DISPERSAL
D.J. WILSON, Univ. of Alberta, *Edmonton, Alberta T6g 2g7, Canada*

Rolling terrain alters trajectory of smokestack plumes and causes higher concentrations at certain locations because of increased atmospheric turbulence.

The proposal is to examine and assess these effects with models of irregular terrain in a wind tunnel in order to simulate lower level atmospheric winds. Tracer gases will be injected into the wind tunnel to simulate the effluent from a stack. Corrective action studies will be made to allow government agencies to assess proposed plant operations and location. Result will be adjustment of allowable emission rates.

SUPPORTED BY Alberta Environmental Res. Trust - Canada

4.0015, DOPPLER RADAR ANALYSIS
E.E. GOSSARD, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8AA73661)

Project objective: To study the detailed three-dimensional air motion field in precipitation and in clear air by means of the Doppler velocity spectra acquired from several radars. Emphasis is placed on convective storm dynamics and small-scale turbulent motion fields.

Current year plan: a. Continue analysis of convective storm data acquired by Dual Doppler radars. b. Using 3-Doppler data, verify 3- dimensional analysis of COPIAN method. c. Develop programs for using 3- Doppler data. d. Study clear air convection and thermal plume structures on data obtained using chaff tracers. e. Continue development of automated data processing methods.

Progress report: a. Chaff data, snowstorm data and convective storm data were analyzed, and the results indicate the power of the COPIAN method to obtain 3-D wind fields. b. Boundary layer observations using dual Doppler radar data showed the applicability of Doppler radar for diffusion and turbulence studies. c. Analytic models were developed which explain the observed structure of the dry convective boundary layer, and numerical modeling was begun.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

4.0016, SUNSET METEOROLOGICAL RADAR
J.L. GREEN, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8DJ4 27 52)

Project objective: To construct and operate a large VHF scatter radar and other instruments at the Sunset Field Site in order to measure winds and turbulence in the troposphere, stratosphere, and mesosphere. To analyze the measurements in terms of tides, waves, turbulent transport, etc., in order to understand better the dynamics of the atmosphere.

Current year plan: Further develop the system, including: improved data processing: improved antenna steering; final development of a Radar Acoustic Sounding System (RASS); bringing into operation a centimetric radar for balloon and hydrometeor velocities. Regular observations of winds at 16 heights simultaneously. Observations of tropospheric temperature profiles using RASS. Analysis of wind observations in terms of tides and waves. Deduction of mixing rates from measurements of turbulence. Study of the radar scattering mechanism.

Progress report: The sensitive VHF radar constructed in FY 1974 was used to obtain Doppler (velocity) spectra of motions in the atmosphere from 4km to 100km above sea level. The measured winds were compared with nearby balloon winds. The radar part of the RASS system has been developed.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

4.0017, SATELLITE TIME SERVICE DEVELOPMENT
D.W. HANSON, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Boulder, Colorado* 80302 (2776119)

Objective: To meet the need for a widely available, low-cost, satellite T/F broadcast service operating on the internationally allocated frequency of 400.1 MHz.

Approach: Continue experiments to evaluate formats, modulation techniques and recovery systems with results to be applied in final design of dissemination system. (Present activity with NOAA includes the continuous satellite broadcast of time code to 60 percent of the earth's surface). Increase NBS awareness of other agencies programs using satellites and brief these agencies of the NBS requirements for a spacecraft platform for broadcasting. Establish a formal channel of communication to other agencies through a central (lead) agency. Publicize our project activities and the results to obtain user feedback.

Progress: The first broadcasting of a time code from a SMS/GOES satellite began 9 July 1974 and is now available 24 hours per day. SMS/GOES users have expressed considerable interest in time code for use in aircraft balloons, remote seismic and tsunami stations and an internation magnetometer network. One group of users intends to urge international acceptance of the time code system for use in the European, Russian, and Japanese GOES satellites. The satellite position information was included in the time code format in April 1975 and is now available continuously. A Memorandum of Understanding has preliminary approval by NASA and NBS management with final approval and signatures expected in July 1975. The memorandum establishes a cooperative program between NASA and NBS to design a satellite time and frequency broadcast system and designates NASA as a coordinator to match NBS requirements to other agencies' satellite systems. The first SMS/GOES satellite suffered some hardware failures and an incomplete third stage burn on launch which has delayed the NOAA/NASA check-out of the trilateration system and our development of a system for a very high accuracy time transfer. Also, an unexpected complication in the use of frequencies has forced NBS to transmit satellite position data to Wallops Island Va, via telephone lines instead of satellite. This represented a major, unanticipated effort and has delayed the automation and certification at Boulder of the SMS/GOES broadcasts.

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

4.0018, STRATO NO2 DETECTOR
W.R. HENDERSON, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8DJ43566)

Project objective: Construct an optical spectroscopic absorption instrument to detect the stratospheric NO2 column abundance.

Current year plan: Purchase components and construct the NO2 detector; calibrate and install at a high latitude base station.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

4.0019, EXPERIMENTAL STUDIES ON LASER BEAMS
G.R. OCHS, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8AA7 13 10)

Project objective: Experimental studies of the use of laser beams for remotely sensing atmospheric parameters, particularly wind and turbulence.

Current year plan: Efforts will be made to demonstrate the optical wind sensor to prospective users in various applications, and to improve the present optical device to make it more immune to interfering background lights and to sunlight.

Progress report: A passive wind sensor, using natural ambient light, has been demonstrated. A 'saturation-resistant' wind sensor has been built and tested. Three of the saturation-resistant units have been combined in a divergence triangle for a pre-Sesame test at NSSL in Norman, Oklahoma.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

4.0020, DOPPLER LIDAR DEVELOPMENT

R. SCHWIESOW, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8AA7 30 35)

Project objective: Develop a field Doppler lidar velocity measuring system for studies of boundary layer dynamics, mountain lee waves and vortex phenomena.

Current year plan: Evaluate and calibrate Doppler lidar mounted on vehicle. Continue development of data processing. Measure velocity of vortices and wind profiles.

Progress report: Doppler lidar has been mounted on field-worthy vehicle and preliminary testing has been done. Primitive data processing is complete. Velocity of atmospheric packets artificially enhanced with dust has been measured.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

4.0021, EXPERIMENTAL MEASUREMENT OF THERMAL ENERGY CHARGE-TRANSFER CROSS-SECTIONS OF INTEREST IN RARE-GAS METAL-VAPOR LASERS

G.J. COLLINS, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (NSG 3060; 506-22-41)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0022, EVALUATION OF THE USE OF SALT BRINE FOR DE-ICING PURPOSES

UNKNOWN, State Dept. of Transportation, *Rocky Hill, Connecticut* 06067 (082002 (HRB NO.))

The aim of this study is to evaluate the feasibility of using salt brine for de-icing purposes. Prototype brine dispensing equipment will be developed.

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.H.A.

4.0023, NEUTRON RADIOGRAPHY

H. BERGER, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (3140103)

The objective of this program is to aid the industrial application of neutron radiography as a nondestructive testing tool by (1) contributing to the improvement of standards in the field, (2) furthering the development of the method, and (3) encouraging use by demonstrating applicability. A further objective is to make use of neutron radiography in NBS and other agency programs.

The use of neutrons for radiography contributes to enhanced NDE capability. As compared to x-radiography, neutron methods offer advantages by virtue of differing attenuation characteristics (light elements such as hydrogen, lithium and boron strongly attenuate thermal neutrons, while most heavy elements are reasonably transparent), sensitivity to isotopic variations, and the capability for inspection of highly radioactive material. These characteristics have led to application of neutron radiography in the nuclear industry (fuel elements, control materials), and the aerospace industry (explosive devices, turbine blades, fuels). The expansion of use of neutron radiography in these industries and others will contribute to better quality assurance.

The design for a second neutron radiographic beam facility at the NBS Reactor has been completed and construction of components had begun. The new beam facility will expand the neutron radiographic capability by offering higher beam intensity (and therefore, improved collemation potential) and a broad neutron spectrum so that radiography with cold and epicadmium neutrons can be pursued.

Contrast agents for visualizing cracks in aluminum fatigue specimens have been under development. Gadolinium nitrate material in several fluids appears excellent for this application. Initial results of a three-dimensional thermal neutron radiographic method being pursued with Argonne National Laboratory show promise for the potential of that method.

A symposium on Practical Applications of neutron Radiography and Gauging was held at NBS in February under joint sponsorship of NBS and ASTM. About 150 attendees heard 28 papers presented at the 2-day meeting. The proceedings of the meeting will be published by ASTM as STP 586.

A survey of the needs for standards in the neutron radiography field was conducted and a report prepared. The report lists the needs for neutron radiography and gauging standards. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

4.0024, AUTOMATION TECHNOLOGY

J. EVANS, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (6006111)

Objectives: (1) To improve the quality and increase the productivity of selected public services through automation by providing calibration techniques and performance measures for computer based sensors and computer control systems. (2) To reduce the hazards of public service tasks by providing standards and guidelines for the use of automation technology for dangerous tasks such as handling and disposing of explosives or remote handling of radioactive fuel from nuclear reactors. (3) To reduce Government operating and procurement costs through cooperative development of interface standards and other specifications for computer-aided design and manufacturing systems.

Approach: The approach of the program is to focus NBS capability in measurement science, which is the scientific base underlying sensor technology, and in computer science, which underlies computer control technology, on the problems of automation and to apply that capability in helping other Government agencies meet their mission objectives. The major outputs of the program are standards, guidelines, performance measurement techniques, specifications, and consulting services that will stimulate the diffusion of automation in the Goverment and in industry. As a test bed for this work, ICST has a research robot manipulator system and has procured a 2-axis NC mill in cooperation with the NBS Instrument Shops Division. Following a hierarchical concept of control, at each level DACT is investigating and demonstrating the technology involved, is working with another Government agency on some specific applications of that technology, and is then developing standards, guidelines, and other generic outputs which will make this experience useful to all other Government agencies and to the private sector.

Progress (FY75): Work was completed on the first level of control (servo control) and specifications for procurement of research robot systems and low-cost mobile robots have been prepared for the use of Government agencies. Support was provided to the DoC Office of Export Administration on export control of NC tools and a paper was prepared for the OECD on the application of computer based automation in energy resource discovery and recovery. At the second level of control, new computer-based cooordinate transformation techniques were developed for the control of manipulator systems. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

4.0025, TELEPROCESSING POLICY COORDINATION

E.J. ISTVAN, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (6002103)

Objective: To conduct broad program planning with appropriate Federal and local government agencies and offices, and with private sector computer and communications organizations, relative to development of appropriate programs and policy structures for enhanced applications of teleprocessing through computer networks as a new ADP technology.

This project involves the planning and coordination of appropriate research, measurement calibration, testing, and analysis projects and programs for advancing the state-of-the-art in the application of modern telecommunications systems and services for data transmission and teleprocessing, and recommendation of appropriate programs, including programs of co-sponsorship and contracts and grants for directed research and development, oriented towards improving computer utilization in the public interest through enhanced applications in public service and in industrial technology.

The project requires continuous liaison with ADP and communications equipment manufacturers, telecommunications common carriers, arrangement of appropriate participation in Professional Societies and Trade Associations, such as the Electronic Industries Association (EIA), Institute of Electronics and Electrical Engineers (IEEE), American Institute for Aeronautics and Astronautics (AIAA), and planning of collaborative efforts with the National Academy of Sciences (NAS) to foster the development and operations of new telecommunications services which can enhance the teleprocessing effectiveness of computer and data networks.

The project arranges for appropriate NBS assistance and advice to the Department of State and other designated responsible agencies and arranging and participation in collaborative efforts with international organizations such as the Organization for Economic Cooperation and Development (OECD), International Telecommunications Union (ITU), Consultative Committee for International Radio (CCIR), concerned with new applications of telecommunications techniques, and standards and practices relating to computer and information networking.

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

4.0026, PROJECT MAILNET
C.J. WITZGALL, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (2050481(NBS NO.))

Objective. To provide sound efficient mathematical methods for use in the U.S. Postal Service's studies of a satellite-based Electronic Mail System (EMS). Emphasis is on which cities should be the early sites of the Electronic Mail Facilities (EMF's) making up the system.

Approach: Mathematical methods reviewed in phase 1 (FY 1974) involved techniques of linear and nonlinear programming, graph theory, and approximation theory. The preferred alternatives are being refined, and tested on USPS-supplied data and jointly-formulated scenarios.

Progress: The beginning of this project was a small study performed for USPS during Spring 1974. Dealing (as does the current phase) with a satellite-based 'electronic mail system', it involved a survey of mathematical methods useful for deciding in which areas ground stations should be located. A number of techniques were formulated and evaluated; two of them, an inexpensive heuristic 'incremental' approach and a flexible 'cost-benefit' approach using network-flow optimization techniques, were recommended for further development. (These recommendations have been accepted.) Contractual requirements were met with a brief report, and so detailed documentation -- a matter of low priority to the sponsor -- is only now about to be submitted to WERB. FY 75 funding was not received until November, by which time staff had prior obligations which delayed the start of work until January. This work, scheduled for completion by December 1975, has concentrated on further specification of the mathematical models, and on associated tasks of system definition and data evaluation. A particularly important step is the just-completed preparation of a working paper giving a functional (rather than hardware-type) description of the system and of the cost elements arising at its various levels, taking into account the different degrees of geographical 'fineness' that may be desired for different analysis purposes. This step brings the above- mentioned cost-benefit approach much closer to the point of practical usefulness. We have also implemented the first version of the algorithm to be used in the model, and have it running on the USPS computer. In addition, we are acting as the sponsor's advanced mathematics 'arm' in activities preceding the letting of contracts. (Text Abridged)

SUPPORTED BY U.S. Postal Service

4.0027, SEA ICE REMOTE SENSING INVESTIGATION
W.J. CAMPBELL, U.S. Dept. of the Interior, Geological Survey, *Washington, District of Columbia* 20242 (7-441; 5-14733)

Subjective: To design and implement remote sensing experiments to provide data which will contribute to the development of sea ice dynamics models and prediction techniques.

Approach: Emphasis for the remote sensing data collection will be on the Arctic Ice Dynamics Joint Experiment (AIDJEX) Ocean north of Alaska which will be manned and emplanted with buoys during the period April 1975 through April 1976. NASA and other aircraft will periodically collect photo, IR and microwave data over the AIDJEX area. In addition, imagery from LANDSAT-2 and NOAA satellites will obtain data over a broader area than the aircraft. The distribution of ice thicknesses as well as strain indicators will be derived from these remote sensor sources and related to measurements made at the surface sites to test and refine the model. Dr. Campbell, Project Leader of the USGS Ice Dynamics Project is Principal Investigator and will coordinate the remote sensing operations.

Progress: The AIDJEX test site was used for remote sensing overflights in 1970, 1971, 1972, and 1973. Another AIDJEX experiment is underway in April 1975 and will continue through April 1976. Progress in observing and predicting sea ice distribution and movement with ERTS multi-spectral and NOAA VHRR sensors has been made. Research is underway to relate satellite IR data to sea ice thickness. Aircraft microwave data taken in 1971 was successfully enhanced to indicate distinction between young and multi-year ice. Interpretation of NIMBUS microwave imagery over Arctic ice indicates the feasibility of ice mapping under cloudy conditions. US/USSR carried out the Bering Sea (BESEX) experiment in 1973 providing remote sensor data for comparison to ship, helicopter and meteorological data.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

4.0028, ELECTRONICS FABRICATION STUDIES
P. BOYD, Washington Technical Institute, Undergraduate School, *Washington, District of Columbia* 20008 (NAS 5-22383; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0029, ENERGY-CONSERVING BUILDING METHODS IN RESIDENTIAL AND URBAN CONSTRUCTION
K. GERTIS, Fraunhofer Society, Inst. For Construction Physics, *8150 Holzkirchen, Bayern, Federal Republic of Germany*

Goal: The energy situation in residential and urban construction is marked on one hand by an enormous increase in energy needs in the next ten years, and on the other by the effects of the worldwide energy shortage. The size of the energy needs construction and the difficulties connected with satisfying these needs require a critical overall examination. On the part of construction physics it is to be clarified if, and by what means the heating technology concepts of outside construction components can be improved with respect to energy economy (e.g., winter problems) and if solar energy can be used through climatically propitious construction methods.

Work Plan: Through theoretical studies, the following points should be investigated for their energy-economic effects: Optimal insulation of outside construction under consideration of the construction-technological, climatological, energy-economic, and financial effects; Influence of the heat losses and heat gains through window surfaces on the room energy balance; Connection between window size, solar radiation, and lighting energy; and Behavior of construction parts with radiation-selecting surfaces and latent reservoirs from the energy technology view.

SUPPORTED BY Fed. Rep. of Germany - Min. For S.C. & U.P

4.0030, APPLICATIONS OF NEAR-FIELD MEASUREMENTS FOR NASA REQUIREMENTS
UNKNOWN, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (NAS 5-22344; 310-20-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0031, STUDY OF ELECTRICALLY SMALL ANTENNAS FOR WILDLIFE MONITORING
UNKNOWN, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (NAS 5-22422; 178-57-81)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0032, EVALUATION OF LITHIUM/SULFUR ELECTRIC BATTERY FOR AUTOMOBILE PROPULSION
UNKNOWN, U.S. Energy Res. & Dev. Admin., Chicago Operations Office, *Lemont, Illinois* 60439 (048902 (HRB NO.))

The objective of the studies is to establish the overall design requirements of a lithium/sulfur battery for use in an electric automobile and to test and evaluate full-scale prototype lithium/sulfur battery cells under realistic conditions in order to determine how well they meet the design requirements.

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4.0033, SIMULATION AND EXPERIMENTAL STUDIES OF MICROWAVE TO DC ENERGY CONVERSION SYSTEMS
J.J. NAHAS, Univ. of Notre Dame, School of Engineering, *Notre Dame, Indiana* 46556 (NSG 3070; 506-90-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0034, CONTINUED STUDY OF SHOCK TUBE FLOW OVER AIRFOILS
W.J. COOK, Iowa State University, School of Engineering, *Ames, Iowa* 50010 (NCA 2-40406; 501-06-09)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0035, STUDY OF VISCOUS CROSS-FLOW EFFECTS ON CYLINDERS AT HIGH REYNOLDS NUMBERS
W.D. JAMES, Iowa State University, School of Engineering, *Ames, Iowa* 50010 (NSG 2091; 501-26-04)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0036, INVESTIGATION OF THE USE OF SHOCK TUBES IN TRANSONIC TESTING
UNKNOWN, Iowa State University, Graduate School, *Ames, Iowa* 50010 (NCA 2-40506; 505-06-42)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0037, DEVELOPMENT OF CAPABILITIES FOR STALL/SPIN RESEARCH
A.J. CRAIG, Wichita State University, School of Engineering, *Wichita, Kansas* 67208 (NSG 1189; 505-10-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0038, DESIGN, FABRICATE, TEST AND INSTALL OSCILLATING PLATFORM
C.F. KNAPP, Univ. of Kentucky, School of Engineering, *Lexington, Kentucky* 40506 (NAS 2-8883; 970-21-17)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0039, RESOLUTION ENHANCEMENT OF THE IOE BREADBOARD ECHELLE SPECTRA
A. ROSENFELD, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (NCA 5-5; 868-13-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0040, DETERMINING THE OBSERVING PROGRAM AND INTERPRETING THE LIVETIME DATA OF A SATELLITE X-RAY DETECTOR
G. WESTERHOUT, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (NCA 5-7; 821-32-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0041, CONDENSED FUELS FOR HIGH ENERGY LASERS
O.H. DENEGEL, U.S. Navy, Propellant Science Department, *Silver Spring, Maryland* 20910 (DN585203)

To develop fuels for high energy lasers.

(1) Formulate and characterize condensed fuels which generate a 25- 60 percent N2, 25-60 percent CO, 10-20 percent CO2, and 5-15 percent HCl high-temperature gas mixture. (2) Test and evaluate these fuels in the NavSurfWpnCen, Indian Head, Combustion GDL. (3) evaluate in the NavSurfWpnCen, Indian Head Combusion GDL, the potential of a CO/N2- pumping gas mixture with and without catalyst gas (H2O/HCl) for gas dynamic mixing laser (GDML) application. (4) design and construct a GDML nozzle for use in the NavSurfWpnCen, Indian Head Combustion GDL System. (5) test and evaluate GDML gases and condensed fuel compositions.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0042, MONITORING OF ELASTIC STRESSES BY ACOUSTIC EMISSION
J.H. WILLIAMS, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 3064; 506-90-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0043, DESIGN AND FABRICATION OF A STRATOSPHERIC AITKEN NUCLEI DETECTION SYSTEM
UNKNOWN, General Electric Company, *Pittsfield, Massachusetts* 01201 (025413 (TRAIS NO.))

Subject procurement action has been initiated under PPA OS220 in support of the Climatic Impact Assessment Program (CIAP) at the request of the sponsor. The procurement will result in the delivery of a Stratospheric Aitken Nuclei Detection (SAND) System for measurement of ambient background levels of stratospheric particulates.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0044, LASER DAMAGE TOLERANCE OF COMPOSITE PANELS
J. PLUMER, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0F4747)

Current aircraft fuselage construction features a skin supported by stringers and frames. The foreseeable threats of mid-intensity warfare, in this study, high energy lasers, appear capable of destroying substantial portions of such structures with a single hit. The objective of this research will be to assess damage tolerance of composite panel materials suitable for monocoque fuselage construction. Such construction avoids severe structural degradation resulting from projectile impact and explosive rupture of a frame and several adjoining stringers by eliminating these elements and carrying all aerodynamic loads in the composite 'skin.' Monocoque construction not only avoids the thin skins susceptible to rapid burn-through by high intensity radiation, but also permits utilization of laser-inhibiting materials as a structural component of the fuselage. Through assessment of damage tolerance, this research will develop composite panel materials optimized for aircraft survivability against the indicated threats.

Panel sections will be fabricated in various designs embodying combinations of fiber-reinforced skin and core materials in selected configurations. These panels will be subjected to damage

by high intensity radiation. The nature of damage will be determined and degradation of structural properties measured. Through analysis of test data, design criteria for composite panel materials tolerant of such damage will be established.

Supporting agency address information: AMC Materials & Mechanics Rsch Center, Attn-AMXMR-RD, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

4.0045, HARDENING OF TRANSPARENT MATERIALS AGAINST LASER RADIATION
R.E. SACHER, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0F4751)

Current transparent materials utilized in windshields, protective masks, goggles, etc. exhibit inadequacies when interacted with laser weapons. The objective of this effort will be to assess the optical, thermal, ballistic and mehanical damage tolerance of novel transparent materials to optimize protection against high energy lasers.

Novel transparencies suitable for optical use that will dissipate the energy from gas dynamic lasers, for short periods, will be subjected to laser radiation from both the 3.8 and 10.6 laser systems. Ablative type materials such as perfluorosulfonic acid type membranes and polysilicones will be utilized and tested in sheet, coating and adhesive form in different configurations. Critical properties such as optical, thermal, ballistic and mechanical will be evaluated to choose the optimum transparency system for a specific application.

Supporting agency address information: AMC Materials and Mechanics Research Center, Attn-AMXMR-RA, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

4.0046, LASER-INDUCED DAMAGE AND MECHANICAL PROPERTY CHANGES RESULTING FROM LASER IR-RADIATION
L.A. SHEPARD, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0F4749)

Although damage mechanisms associated with high-energy laser irradiation of materials are commonly considered to be melting and/or spallation, lower radiation intensities (or brief exposures) may produce shallow heat-affected zones on surfaces of exposed metal components, leading to accelerated failure by other fracture mechanisms. The objective of this program will be to ascertain the nature and extent of micro-structural changes produced by laser irradiation of materials commonly used in Army helicoptor components. These changes will be assessed metallographically and their effect on fatigue life and stress- corrosion cracking will be determined. Methods for deterring microstructural transformation of the surface, such as by diffused surface layers, will be evaluated.

Specimens of low-alloy structural steels, titanium alloys, and high-strength aluminum alloys, typical of a variety of helicoptor components (e.g., the rotor hub assembly in the case of the steel or titanium alloy) will be exposed to increasing levels of laser radiation to determine the time/intensity threshold for the inception of surface damage. Specimens will be tested in low-cycle fatigue under ambient conditions and also in an environment of a 3 1/2 percent solution of NaCl. The steel specimens will also be fatigue tested in a distilled water environment. Standardized stress-corrosion tests will be performed as well. Particular attention will be paid to the possibility that materials, normally susceptible to stress-corrosion only in the precracked condition, may have been rendered susceptible due to laser damage. Specimens will be subjected to a variety of diffusion treatments in which the surface composition will be altered in a manner designed to deter surface transformation. Elements such as chromium and silicon will be diffused into the surface prior to exposure to the laser, and the specimens will then be tested as before.

Supporting agency address information: AMC Materials & Mechanics Research Ctr, Attn-AMXMR-D, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

4.0047, PULSED ACOUSTIC SENSOR
R.D. KODIS, Avco Corporation, *Wilmington, Massachusetts* 01887 (045382 (TRAIS NO.))

The objective of this engineering development is to design, build, test and deliver an engineered, pre-prototype pulsed acoustic sensor which could serve as one element of an aircraft wake vortex warning system. The particular sensor to be produced under this contract is a pulsed bistatic acoustic radar (ACDAR) capable of detecting and tracking aircraft wake vortices in the terminal area in real time.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0048, V-RING ARRAY AND INTEGRAL MONITOR
UNKNOWN, Andrew Alford Consulting Engr., *Winchester, Massachusetts* 01890 (038186 (TRAIS NO.))

The primary objective of this work is to develop a V-Ring array and integral monitor that provides essentially the same operational performance over the localizer RF band without the need for critical adjustments requiring complex prodedures and/or specialized test equipment. It is further objective that the end result of this work will be fabrication of modification kits containing the hardware and instructions for field implementation of the redesigned array and integral monitor system.

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SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

4.0049, TESTING AND COMPARATIVE EVALUATIONS OF THREE ANTENNA SYSTEMS
J. FERRIS, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (NAS 3-19533; 610-22-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0050, ICE DETECTION SYSTEM ON BRIDGES (ROUGE RIVER IN DETROIT, PROJ I-75-1(156)45)
ORNE, State Dept. of Highways & Tr., *Lansing, Michigan* 48904 (083646 (HRB NO.))

This project will attempt to eliminate accidents caused by icy bridge decks by alerting maintenance crews and activating automatic de- icing chemical spreaders.

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SUPPORTED BY U.S. Dept. of Transportation - F.H.A.

4.0051, DESIGN AND DEVELOPMENT OF SCANNERS FOR STRIP CHARTS AND MICROFILM ELECTROCARDIOGRAMS OF PILOTS
UNKNOWN, Dicomed Corporation, *Minneapolis, Minnesota* 55435 (045082 (TRAIS NO.))

Study will provide for the design and development of a system which can scan, digitize, analyze and store strip chart and microfilm electrocardiograms taken of pilots in application for and renewal of Class I certificates. This will enable the selective screening of electrocardiogram records so that incipient heart problems which only show up through a comparative analysis of records taken over a period of years can be detected.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0052, DESIGN AND DEVELOPMENT OF THE BUS NEUTRAL MASS SPECTROMETER
A.O. NIER, Univ. of Minnesota, School of Engineering, *Minneapolis, Minnesota* 55414 (NAS 2-8812; 825-20-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0053, STUDY OF ELECTRON ACCELERATOR EXPERIMENTS USING SUBSATTELITES AS DETECTORS
J.R. WINCKLER, Univ. of Minnesota, School of Engineering, *Minneapolis, Minnesota* 55414 (NAS 8-31510; 356-36-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0054, EVALUATION OF SOLID WASTE MATERIALS FOR HIGHWAY USES
R.M. MORCHINEK, State Dept. of Highways, *St. Paul, Minnesota* 55101 (082287 (HRB NO.))

Two solid waste products, taconite tailings and power plant slag, are being evaluated for use in highway construction and maintenance. These uses included seal coats, bituminous wearing courses, base materials, embankment materials and de-icing materials.

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SUPPORTED BY Minnesota State Government - St. Paul

4.0055, PRELIMINARY AEROSOL GENERATOR DESIGN STUDIES
J.F. STAMPFER, Univ. of Missouri, School of Science, *Rolla, Missouri* 65401 (NAS 8-31538; 645-10-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0056, ASSESSMENT AND DOCUMENTATION OF OIL AND HAZARDOUS SUBSTANCES SPILLS
V.W. LAMBOU, U.S. Environ. Protection Agcy., Natl. Environ. Research Center, *Las Vegas, Nevada* 89114 (1HA325)

Objectives: Develop standard operating procedures and manuals for assessing oil and hazardous materials spills utilizing up-to-date monitoring techniques, and develop airborne remote sensing instrumentation for spill detection and assessment.

Approach: Prepare reports and manuals describing spill characteristics, hazards and effects for use by spill response personnel; identify and evaluate analytical techniques and equipment for spill monitoring; develop and evaluate field spill response categories; assess and develop advanced remote sensing techniques for spill qualification and quantification, and all-weather oil spill detection.

Current Plans/Progress: Data collection on hazardous substances characteristics and effects initiated; development of spectral scanning remote sensing instrumentation initiated.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

4.0057, JOINT OBSERVATIONS FOR COMETARY RESEARCH
F.L. WHIPPLE, New Mexico Inst. Min. & Tech., Graduate School, *Socorro, New Mexico* 87801 (NCA 5-30; 196-41-52)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0058, DESIGN, FABRICATION, TEST AND INSTALLATION OF AN ATCRBS ELECTRONIC SCAN ANTENNA
UNKNOWN, Hazeltine Corporation, *Greenlawn, New York* 11740 (019508 (TRAIS NO.))

The purpose of this effort is to provide improvement to the Air Traffic Control Radar Beacon System (ATCRBS) through the development of an engineering model of an Electronic Scan Antenna which will reduce reflection false targets and missing targets due to ground lobing. The antenna will capable of providing main beam and side lobe suppression patterns from the same aperture and will be electrically and mechanically independent of the primary radar.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

4.0059, STUDIES IN ROTATIONAL FLOWS ESPECIALLY ASYMPTOTIC METHODS 12373-M
G.S. LUDFORD, Cornell University, School of Engineering, *Ithaca, New York* 14850 (DA0E8974; DAHC04-75-G-0016)

Develop mathematical techniques for deducing physically realistic solutions in fluid mechanics with special stress on rotational flow problems. Development of rigorous mathematical tools for the study of dynamics of rotating fluids has considerable relevance to the Exterior Ballistics Laboratory at BRL and Army aerodynamic research. Specifically, this study may enhance our understanding of the performance of projectiles and missiles, in particular the influence of free boundary layers on the internal motion of payloads.

The method of matched asymptotic expansions with or without a turning point.

Supporting agency address information: AMC Army Research Office, Box CM, Duke Station, Durham, N. C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

4.0060, ADVANCED BEAM DIAGNOSTIC SYSTEM
R.L. HICKOK, Rensselaer Polytechnic Inst., School of Engineering, *Troy, New York* 12181 (NSG 3057; 506-25-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0061, DIRECT ENERGY TRANSFER POWER SUBSYSTEM MODELING AND ANALYSIS
T.G. WILSON, Duke University, School of Engineering, *Durham, North Carolina* 27706 (NAS 5-22475; 608-21-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0062, SIMULATION OF P3G TWO STAGE FAN
W.M. STEENKEN, General Electric Company, *Cincinnati, Ohio* 45215 (DF457720; F33615-75-C-2029)

The objective of this effort is to demonstrate that a digital computer model consisting of a computer model of the planar pressure pulse generator (P3G) coupled to a computer model of a two stage fan will provide an accurate simulation of the P3G/two-stage fan test data and an evaluation of one-dimensional digital modeling techniques, and to define the manner in which the aerodynamics of the fan responds to the unsteady flow created by the P3G.

Currently existing digital computer models of the P3G and two-stage fan will be coupled together. The geometry of the Lynn Fan Test Facility will be included in the computer model. The computer models will utilize previously substantiated analytical techniques capable of treating the dynamics of the above hardware. The computer model will analyze the two stage fan on a blade-row by blade-row basis and will have the capability of identifying blade incidence angles. The entire analysis will be based upon one-dimensional flow considerations. The effort will be directed toward the utilization of the previously obtained P3G/two-stage fan test data to substantiate the frequency range capability of the computer model relative to those frequencies and nonrepetitious surge points tested within the P3G/two-stage fan test program (F33615-73-C-2001).

Supporting agency address information: AF Aero-Propulsion Laboratory TBA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0063, THERMAL ANALYSIS OF COMPOSITE PANELS
A.H. NAYFEH, Univ. of Cincinnati, School of Engineering, *Cincinnati, Ohio* 45221 (NSG 1185; 743-01-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0064, EFFECT OF BODY FORCES ON MOTION AND HEAT TRANSFER OF CONFINED FLUIDS
S. OSTRACH, Case Western Reserve Univ., Graduate School, *Cleveland, Ohio* 44106 (DF009080; AF-AFOSR-2342-72)

Air Force aircraft, missiles, and satellites and their components make use of flowing fluids confined in tanks, pipes, ducts, and hoses. Examples are fuel, oxidant, hydraulic fluid, coolant, or refrigerant. The knowledge of many aspects of such flows is fragmentary. The secondary flows induced by suction or injection at discrete points in a system may have a profound influence on its performance, yet little is known about them. Also, such systems

often have protuberances partially blocking the flow passage. The detailed flow patterns about such objects are not well understood. This research is attacking both of these classes of phenomena in an effort to delineate causal relations among gross flow features as well as to make quantitative predictions where possible. A different phase of the research is investigating the superposition of a thermal instability on a through-flow as a means of augmenting the convective heat transfer.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0065, DIGITAL FLIGHT COMPENSATION FOR DESCENDING, CONSTANT VELOCITY SPIRAL PATHS
R.H. FOULKES, Youngstown State University, School of Engineering, *Youngstown, Ohio* 44505 (NSG 1199; 513-52-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0066, PIEZORESISTIVE SOLID-STATE PRESSURE SENSOR
S.K. KAHGN, Univ. of Oklahoma, School of Electrical Engin., *Norman, Oklahoma* (NSG 1183; 502-03-53)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0067, WIND SENSOR DEVELOPMENT
J. ARAKELIAN, Pharos Incorporated, *Broomall, Pennsylvania* 19008 (DN590045; N00019-75-C-0244)

To develop a lightweight, reliable wind measurement device that employs no moving parts for use on automatic weather stations.

The contractor is developing a no-moving-parts wind sensor of unique design. The wind force is determined by electrically measuring the displacement of fixed plates. The purpose of this contract is to determine the effects of a range of temperature variations on the performance of the sensor. The tests will be conducted in a wind tunnel.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0068, SIMPLEX COMMON DIGITIZERS
J. CHESTNUT, Burroughs Corporation, *Paoli, Pennsylvania* 19301 (014744 (TRAIS NO.))

Design and fabrication of one search quantizer printed circuit board for evaluation by the Federal Aviation Administration as a means towards improvement in the capability of the search radar quantizer to improve operation in clutter conditions.

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SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

4.0069, PURCHASE MEDIUM SPEED LINE PRINTERS
H. FULMER, O D E C Computer Systems Inc., *Warwick, Rhode Island* 02886 (025205 (TRAIS NO.))

Manufacture and deliver 44 Medium Speed Line Printers and associated services. Printers will be installed in all 20 Air Route Traffic Control Centers, NAFEC and the FAA Academy.

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SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

4.0070, PIONEER/VENUS NEUTRAL MASS SPECTROMETER
J.H. HOFFMAN, Univ. of Texas, Graduate School, *Dallas, Texas* 75230 (NAS 2-8802; 825-20-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0071, DELFT MOLTEN SALT PROJECT (DMSP)
B. VRIESEMA, Delft Univ. of Technology, Lab. For Thermal Power Engin., *Delft, the Netherlands*

Developing a technology (including measuring apparatus and controllers) to apply salts as a coolant in high-temperature processes (500-700 degrees C).

Subprojects are: a) Molten salt technology. b) Bayonet type steam boiler.

The current trend of applied chemical and physical processes (concerning power generation) is towards high temperatures. The development is impeded by the scarcity of useful coolants. Merely liquid metals (e.g. sodium) and molten salts (e.g. alkali fluorides) satisfy the conditions concerning vapour pressure, chemical stability and heat transfer. Elsewhere in The Netherlands research institutions are developing liquid sodium technology, therefore this investigation focusses on the technology of molten fluorides.

These salts are not inflammable and do not react explosively with water. The compounds are a possible alternative for sodium. The bayonet type steam boiler is one of the possible designs that can satisfy the extreme qualifications, required for sodium-cooled fast breeder reactors. The application as a molten salt-cooled reactor is doubtful, because of the temporization of the molten salt-cooled breeder in the United States.

SUPPORTED BY Delft Univ. of Technology - the Neth.

4.0072, EVALUATION OF TEMPERATURE EFFECTS ON BITUMINOUS PAVEMENT DEFLECTIONS IN VIRGINIA
N.K. VASWANI, State Highway & Transp. Coun., *Charlottesville, Virginia* 22903 (082615 (HRB NO.))

The purpose of this study is to determine the changes in pavement deflection due to temperature variation and to determine the correlation between mean pavement temperature and the correction factor. The scope of this study is to: (1) utilize data from studies carried out by other investigators, (2) use temperature and deflection data previously collected in Virginia, and (3) carry out field tests specially for this study on about nine satellite projects.

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.H.A.

4.0073, QUALITY CONTROL CHECKS FOR VGH RECORDS
A.B. ROBY, Coll. of William & Mary, Undergraduate School, *Newport News, Virginia* 23606 (NAS 1-14034; 505-08-20)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0074, DEVELOPMENT OF HIGH-PRESSURE GAS LASERS AND HETERODYNE DETECTOR SYSTEMS IN THE 8 TO 11 MICRON SPECTRAL REGION
E.C. KINDLE, Old Dominion University, School of Science, *Norfolk, Virginia* 23508 (NSG 1197; 506-18-12)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0075, ANALYSIS OF REMOTE SENSORS FOR POLLUTION
J.H. PARK, Coll. of William & Mary, Graduate School, *Williamsburg, Virginia* 23185 (NSG 1203; 176-21-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0076, COOPERATIVE PHOTOGRAMMETRIC STUDIES
S.A. VERESS, Univ. of Washington, School of Engineering, *Seattle, Washington* 98105 (100568 (HRB NO.))

The objective is to establish a method of methods as well as specifications for new means of photographic image acquisition by helicopter or fixed-wing aircraft in order to enable the highway department to fly in all weather conditions and to increase accuracy standards.

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.H.A.

4.0077, DESIGN AND DEVELOPMENT OF THE PIONEER/VENUS NET FLUX RADIOMETER
V.E. SUOMI, Univ. of Wisconsin, School of Natural Sciences, *Madison, Wisconsin* 53706 (NAS 2-8813; 825-20-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, TUCSON OBSERVATORY
J. MINSCH, U.S. Dept. of the Interior, Geological Survey, *Tucson, Arizona* 68001 (9920-01254)

States to which project pertains: Arizona.

The GS operates and maintains a national and world-wide network of observing and reporting systems. Included are facilities and systems for describing, mapping and charting the earth, utilizing seismological and geomagnetic science and technology, and conducting related research and development. Tucson observatory provides seismological data which are used to describe the occurrence of earthquakes and their effects on lives and property, and to monitor and record vibrations in the earth caused by earthquakes and large man-made disturbances. This information contributes to a better understanding of the earth's crust, mantle, and core; and of the nature of seismic hazards and risk. Magnetic data are used to periodically update regional and world magnetic charts, and to determine correction factors applicable to magnetic field measurements made by land, marine, and airborne magnetic survey parties. Additionally, this information supports studies in ionospheric physics, radio propagation phenomena, electrical conductivity, the composition of the core and mantle of the earth, and interplanetary space. Knowledge of magnetic declination and its secular change is required as input to the compilation of all sea and air navigation charts for use by marine and aircraft navigators and by public and private surveyors.

Continue the present geomagnetic program. Negotiate a contract to operate and maintain the WWNSS. Telemeter a seismic signal from Tucson Observatory to Newport Observatory for input to the Tsunami Warning Service. Transfer operation of Tucson Observatory to the Branch of Theoretical and Applied Geophysics. Utilize personnel from the Tucson Observatory in other projects within the Seismicity and Risk Analysis Branch.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0002, INFRARED ABSORPTION STUDIES OF ICES
U. FINK, Univ. of Arizona, Lunar & Planetary Laboratory, *Tucson, Arizona* 85721 (NCA 5-47; 196-41-50)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0003, GENERATION AND ANALYSIS OF A MONODISPERSED AEROSOL
T.T. WOODSON, Claremont College, Undergraduate School, *Claremont, California* 91711 (NAS 2-8925; 514-52-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0004, STUDY OF THE PANCOPE VALLEY OPHIOLITE COMPLEX
UNKNOWN, Calif. State Univ. & Colleges, Undergraduate School, *Cotati, California* 94928 (NCA 2-20601; 195-21-04)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0005, DEPLETIONS AND PHYSICAL CONDITIONS WITHIN DIFFUSE INTERSTELLAR CLOUDS
M.A. JURA, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NSG 5070; 831-42-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0006, EXPERIMENTS IN OCEANOGRAPHIC AEROSPACE PHOTOGRAPHY
D.S. ROSS, Internat. Imaging Systems Corp, *Mountain View, California* 94040 (K7-532; 3-35337)

The objective of this research contract was to test film and techniques for improved ocean image recording. The proposed approach was to fly various films in the New York Bight area test site. Because of logistic problems, the tests were made over Lake Tahoe in California.

The results of the Lake Tahoe overflights and data analysis were successful in determining the relative utility of various films, filters, and processing techniques for comparison with regard to depth penetration, quality of target details and contrast between targets and background. Comparative data for depth penetration, contrast information, subsurface detail, atmospheric scattering effects, exposure techniques, and examples of color and black and white imagery were obtained.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0007, SEVERE STORM MODELLING
R.L. ALBERTY, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8C370408)

Project objective: To improve weather forecasts and storm warning by developing realistic models of storm processes and phenomena through merger of observations and experimental analogues and through numerical combinations of observational data with physical principles.

Current year plan: Physical processes involved in convection will continue to be investigated through use of numerical/mathematical models. Additional work with a numerical simulation of dryline evolution leading to starting convection will be pursued. Changes in the atmosphere's vertical structure during days of developing convection will be scrutinized. Tornado cases will be studied.

Progress report: The non-dimensional core radius in a tornado simulator was found to be primarily a function of a single non- dimensional number (the swirl ratio). Characteristics of a thunderstorm updraft soundings prepared from NSSL archive rawinsonde data are being prepared for publication. The importance of local topography on computed surface divergence fields has been assessed. A mathematical technique was developed to solve the homogeneous, baroclinic, steady- state equations of motion including vertical variation of eddy viscosity.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0008, METEOROLOGICAL PHYSICS
B.R. BEAN, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8AC42001)

Conduct studies of the atmospheric boundary layer, its microstructure and turbulence, utilizing mainly airborne techniques.

Study the microstructure of atmospheric temperature, humidity, refractive index, and wind as a function of height, time and stability.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0009, TSG/ENGDAHL
E. ENGDAHL, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8DJ42508)

Project objective: To collaborate with Dr. J. R. Wait in research in the area of electromagnetic scattering from complex targets whose dimensions are comparable with wavelengths.

Current year plan: Upper atmosphere research, particularly with reference to scattering from hydrometers; hail particles and related targets in geophysical probing.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0010, ACOUSTIC WAVE PROPAGATION
F.F. HALL, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8AA71880)

Project objective: Develop, test and evaluate components, systems and techniques to extend the applications of acoustic sounding of the atmosphere to the measurement of wind, turbulence, temperature and humidity profiles, and to contribute to the atmospheric science literature through evaluation of acoustic measurements.

Current year plan: Continue quantitative evaluation of Haswell '74 Cv data; support Antarctic sounder emplacement and data evaluation jointly with NSF; continue GATE data analysis support; analyze propagation of coherent acoustic waves in the turbulent atmosphere.

Progress report: a) Ct report completed, evaluating quantitatively acoustic backscatter echoes. b) Participated in GATE experiment, and now analyzing data. c) Evaluating Cv data from Haswell '74 experiment. d) Installed sounder at the South Pole, and completed preliminary data analysis.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0011, POLLUTION CHEMISTRY
C.J. HOWARD, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8FK30632)

Project objective: To make laboratory investigations of the basic physical and chemical processes involved in the formation and destruction of atmospheric pollutants and trace constituents and to develop techniques for detecting pollutants and trace constituents in the atmosphere.

Current year plan: (1) A discharge-flow system will be used with the laser magnetic resonance system to study the reactions of free radicals such as OH, HCO, and HO, with atmospheric molecules; (2) a Raman-spin flip laser will be used with a flow system and an opto- acoustic detector to study some atmospheric reactions of NO, with the objective of adapting the system to study some chemical reactions of other trace molecules, such as HONO; (3) a gas chromatograph system will be used to measure the concentrations of some chloro-fluoro-carbon molecules in the atmosphere and reliable systems for calibration purposes and sample collections will be developed.

Progress report: The reaction rates for about 25 chloro-fluoro- carbons with OH radicals have been measured. A new laser system for detecting radicals such as ClO with small rotational constants has been designed and is near construction. A system for collecting uncontaminated gas samples from the stratosphere has been designed and is being constructed and tested.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0012, IONOSPHERIC PHYSICS
A.G. JEAN, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8DJ4 07 20)

Project objective: To advance knowledge and understanding of the ionosphere via research and experimentation to more effectively use the upper atmosphere resources in activities of national importance. Development goals for service include prediction of ionospheric/magnetic storms minimizing natural disturbances to radio communications, electric power distribution system, telephone system, etc.

Current year plan: Will commence recording signals from ATS-F radio beacon satellite (launch date June 1974), data analysis will take place in FY 1975. Plan to conduct ionospheric observations during large-scale rocket firing at Wallops Is., June 1974. Will provide research data. Temperate latitude F-region model will be extended upwards to plasmasphere. Use an harmonic analysis method to provide description of ionospheric parameters. Required in research and useful to EDS.

Progress report: Developed ionospheric data base, supplied to EDS. Theoretical model of equatorial F-region developed to explain effects of E x B. With instrumentation group, completed ground equipment for acquisition of radio signals from the ATS-F radio beacon satellite.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0013, JMOF PLANNING
R. KRINKS, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8AA7 04 81)

Project objective: To provide measurements of meteorological parameters as needed to support the remote sensing program. These measurements are also used in basic atmospheric research.

Current year plan: Provide measurements as needed. Continue planning for and start construction of the JMOF tower and associated instrumentation.

Progress report: Selected JMOF site. Issued invitation to bid on tower construction. Contracted for survey and have advertised for soils analysis and foundation investigation.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0014, ATMOSPHERIC STRUCTURE STUDIES
R.B. NORTON, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8DJ4 60 41)

Project objective: We will investigate various timely atmospheric problems including those relating to the thermosphere and ionosphere but with increasing emphasis on problems in the lower atmosphere.

Current year plan: We will complete the analysis of Skylab occultation data and use this data to study thermospheric composition variations, particularly seasonal and those related to magnetic storms. Available ozone data will be used to test theoretical calculations of changes during PCA events.

Progress report: Owing to technical problems only a limited amount of Skylab data were received; these were reduced to density as a function of altitude. Research in the lower atmosphere was initiated.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0015, OPTICAL AERONOMY
J.F. NOXON, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8DJ4 65 72)

Project objective: Investigation of important problems in atmospheric composition, dynamics and energy budget using optical methods, primarily those involving measurements on atmospheric emission features.

Current year plan: Twilight airglow is used to measure the composition in the mesosphere and thermosphere and its changes. The wind field and temperature are studied by high resolution measurements of the Doppler shape and shift in emission lines originating near 100 and 300 km. Other investigations include optical measurement of stratospheric species affecting the ozone layer, infrared auroral studies from aircraft, intergalactic emission, earth-based measurements of Martian ozone, and rapid (approximately 1 hour) fluctuation in mesospheric temperature and density thought to result from gravity waves.

Progress report: A new optical technique has been developed for measuring both stratospheric and tropospheric NO2 from the ground and has revealed both a major latitude variation in the stratospheric abundance and very low abundance in the unpolluted troposphere. Twilight studies have shown a large seasonal variation in mesospheric ozone. Simultaneous temperature measurements from nightglow at different altitudes show the presence of mesospheric gravity waves. Thermospheric wind measurements show systematic diurnal and latitudinal changes in substantial agreement with theory. The line width of the sodium nightglow gives evidence for a specific chemical reaction source; dayglow sodium observations force the rejection of claims by others of diurnal changes in sodium abundance.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0016, ATMOSPHERIC WATER VAPOR
M. SCHERER, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8G130376)

Project objective: Improve the basic radiometer sensitivity in view of the generally low water vapor and flux levels which are encountered in stratospheric measurements.

Current year plan: Continuation of a joint research program between the University of Oregon and Dr. Peter M. Kuhn (APCL) designed to provide improved measurement of upper at-

mospheric water vapor. This year's goal is to provide a final design for a NOAA-ERL water vapor and clear air turbulence radiometer.

Progress report: Considerable effort has been made to compare the results of water vapor measurements obtained from simultaneous spectroscopic and radiometric instruments with the flight support provided by the NASA AIRO Program.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0017, STRATOSPHERIC MONITORING
A.L. SCHMELTEKOPF, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8FK30183)

Project objective: Conduct an experimental program to monitor the long-term changes in the concentrations of stratospheric constituents which are found to have the potential for upsetting the stratospheric ozone balance.

Current year plan: A comprehensive critical species measurement program will be initiated to obtain altitude profiles, study temporal variations (both systematic e.g. seasonal, solar cycle, etc. and non- systematic of at least non-correlated variations) and study geographical variability. Several techniques will be used to carry out this program, i.e. grab samples, optical absorption and laboratory rate constant measurements.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0018, HURRICANE MODIFICATION
R.C. SHEETS, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8G121332)

Project objective: To produce the necessary information for use in designing and evaluating hurricane modification experiments - primarily using conventional aircraft and satellite data.

Current year plan: Continue development of the variational optimization technique for analysis of experimental and background data. Investigate the seedability of selected portions of hurricanes. Investigate the cloud particle state and super cooled liquid water and ice contents in hurricane clouds. Investigate the boundary layer structure in the high wind speed portion of the hurricane. Investigate the effects of the hurricane on the sea surface temperature and thermocline.

Progress report: Developed a two dimensional analysis scheme based upon the variational approach. Determined and documented the effects of seeding of tropical cloudlines on the environment. Determined the cloud particle states above the freezing level in hurricane Ellen. Determined and documented the cloud particle state at selected levels and in selected clouds in the GATE. Continued studies of the air-sea interaction processes based upon AXBT and aircraft data. Revised Stormfury Pacific plans. Determined the effects of various aircraft configurations and instrumentation on the ability to carry out Project Stormfury Pacific.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0019, HURRICANE RESEARCH
R.C. SHEETS, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8C351331)

Project objective: To increase the understanding of the hurricane structure, interactions, and processes ranging from the microscale to the synoptic scale. These studies are aimed at improving the predictability through better parameterizations, data inputs and/or formulations for models or recognizing significant features leading to predictable storm development or structural change.

Current year plan: Continue investigations of the boundary layer and air-sea interaction processes in the hurricane environment using aircraft data. Continue investigations of the convective structure of hurricanes using high resolution satellite data and airborne and land based radar. Continue investigations of the thermal structure and short-term natural variability of hurricanes. Continue investigations of the micro-physical processes in hurricanes.

Progress report: The micro-physical structure of clouds in subtropical cumulus clouds and hurricanes was investigated and partially documented. An evaluation of the ability to position and determine the intensity of hurricanes and typhoons using various meteorological satellites was made. Turbulence instrumentation was developed and tested for use in investigating the boundary layer and cloud interactions in hurricanes. Determination of the sea surface and thermocline structure in a hurricane was partially documented.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0020, AIRBORNE MEASUREMENT OF THE RADIO EMISSIONS SPECTRUM AND ENVIRONMENTAL VARIABLES OF SEVERE STORMS
P.C. SINCLAIR, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (NSG 1215; 175-21-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0021, RESEARCH IN ATMOSPHERIC SCIENCE
H. LIEBOWITZ, George Washington University, School of Engin. & Appl. Sci., *Washington, District of Columbia* 20006 (NSG 1216; 176-24-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0022, SUPPORT TO THE DOT R&D INFORMATION SYSTEM, TRANSPORTATION RESEARCH ACTIVITY INFORMATION SYSTEM (TRAIS)
E. BIERLY, U.S. Natl. Science Foundation, *Washington, District of Columbia* 20550 (036856 (TRAIS NO.))

Construction of a numerical general circulation mode, extending from the surface to the stratopause, and specifically including the radiation dynamics and photochemistry of the stratosphere. Use of the numerical general circulation model to simulate the atmosphere and the troposphere. In addition, the study of ultraviolet radiative transfer in the stratosphere and the delineation of the ultraviolet radiation fields in the stratosphere and at ground level, in narrow spectral intervals, so as to assess possible radiation hazards to biophysical systems. Use of the numerical general circulation model to simulate the atmosphere as it is perturbed by engine emissions of supersonic jet transports.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0023, DETERMINATION OF POTENTIAL SOLAR POWER SITES IN THE WESTERN HEMISPHERE
H.W. HISER, Univ. of Miami, School of Marine Science, *Miami, Florida* 33149 (NAS 5-22417; 647-20-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0024, STUDY TO DESIGN VARIABLE ORIENTATION SOLAR CONCENTRATORS FOR SPACE APPLICATIONS
D.G. BURKHARD, Univ. of Georgia, School of Arts & Sciences, *Athens, Georgia* 30602 (NAS 8-31565; 647-10-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0025, HIGH RESOLUTION OBSERVATIONS OF THE DIFFUSE LYMAN ALPHA SKY BACKGROUND
T.F. ADAMS, Univ. of Chicago, School of Physical Sciences, *Chicago, Illinois* 60637 (NSG 5068; 831-42-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0026, INTERPRETATION OF METEOROLOGICAL SATELLITE DATA
T. FUJITA, Univ. of Chicago, School of Physical Sciences, *Chicago, Illinois* 60637 (8-011; 04-4-158-1)

Objective: 1. To develop techniques and procedures for getting the satellite data into useful form for the meteorologist. 2. To use satellite data in conjunction with other meteorological data for gaining knowledge and understanding of the behavior and dynamics of mesometeorological systems, particularly thunderstorm complexes producing tornadoes and other severe weather. 3. To develop means of applying satellite data to the problem of 'nowcasting'.

Approach: Meeting those three broad objectives involves numerous and varied approaches, as follows: a) development of gridding, registration and animation, procedures necessary to accurately locate satellite data or to derive cloud motions from these data. b) assisting in the solution of various data problems that inevitably arise with each new satellite. c) collecting special ground truth data during severe weather events that are then used to develop better methods of utilizing satellite data for determining characteristics of convective systems. d) application of satellite data interpretations gained in these studies to the 0 to 6 hour forecast problem.

Progress: Main areas of progress: a) conducted a thorough survey of the April 3, 1974 tornado outbreak; published a color chart showing locations, intensities and times of all tornado occurrences; compiled statistics on duration of tornadoes, on deaths by age, sex, etc. One of the more practical results is that Fujita, impressed by the large number of deaths by head injuries, is recommending more attention to headgear as a part of tornado survival equipment. b) produced, delivered and demonstrated a new version of the cinescope viewer which animates SMS photography by means of strobelighted pictures on a rotating wheel. NWS is now having 35 of these devices built by a private contractor for use at various WSFO.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0027, UTILIZATION OF A DUAL WAVELENGTH RADAR IN VARIOUS METEOROLOGICAL STUDIES
E.A. MUELLER, Univ. of Illinois, Graduate School, *Urbana, Illinois* 61801 (DES75-14221)

This research involves the CHILL radar system in projects to be performed in the Chicago area, in Oklahoma, and in Colorado. Although there are many scientific areas to which the radar data will be applicable, the thrust of the research in the Chicago area concerns evaluation of the impact of Lake Michigan on precipitation processes and in better determination of precipitation frequencies in the suburban and urban areas of Chicago. The importance of both of these factors in the continued growth and expansion of the Chicago area hydrologic system is self-evident. The research in Oklahoma concerns joint Doppler studies with NSSL of severe storms, and the research in Colorado concerns studies of cumulus clouds that develop over the Rockies.

This project will also provide for the maintenance and engineering that a complex radar system requires. This engineering effort will be shared with the University of Chicago. Scientific investigations, in conjunction with other research groups, can only be acccomplished if this system has continuity in its engineering staff. The CHILL system has been cooperatively used, or is planned to be used, with the following groups: University of Chicago, Colorado State University, National Center for Atmospheric Research, the National Severe Storms Laboratory, and the National Hail Research Experiment.

SUPPORTED BY U.S. Natl. Science Foundation

5.0028, TURBULENCE MEASUREMENTS IN MARINE FOG
J.B. RUSSELL, U.S. Navy, Avionics Facility, *Indianapolis, Indiana* 46218 (DN597002)

To determine the nature of the turbulent regime associated with fog at sea.

To participate in sea cruises to collect turbulence data using hot wire anemometer, cold wire thermometer, etc. To evaluate these various sensors according to their ability to measure turbulent fluctuations of atmospheric parameters in a marine fog environment. To reduce the data collected and present them in a format appropriate for interpretation and modeling.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0029, NAVY ENVIRONMENT - ACOUSTIC SOUNDING OF THE MESOSCALE STRUCTURE OF THE SEA BREEZE
S.A. HSU, Louisiana State Univ. Systems, Coastal Studies Institute, *Baton Rouge, Louisiana* 70803 (DN575175; N00014-75-C-0192)

The objective here is to investigate the mesoscale structure of the sea breeze system using acoustic echo sounders. The thermodynamic aspects associated with cloud distributions over coastal areas is not at all well known and without these low-level boundary-layer observations, predictions of mesoscale motions in coastal areas is speculation. Successful naval-marine corps reconnaissance-surveillance missions in coastal areas are directly related to local meteorological conditions and their pre-flight predictions.

Two acoustic radars and other radiosonde and meteorological instruments at the Eglin AFB towers will be utilized. Concurrent satellite cloud cover data will be integrated during the experiment, relationships will be correlated, and a mesoscale atmospheric predictive model formulation will be initiated.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0030, TIME-SPACE VARIATIONS IN MESOSCALE COASTAL CURRENTS
H. ROBERTS, Louisiana State Univ. Systems, Coastal Studies Institute, *Baton Rouge, Louisiana* 70803 (DN575159; N00014-75-C-0192)

The objectives of this project are to determine the relationships between the movement of currents at several scales of motion characteristic of coastal areas, and to determine the mechanisms controlling the transport and accumulation of sedimentary materials at these same scales of motion. This is a necessary first step toward enabling remotely sensed observation of regional scale currents to act as predictors of currents at the scales which affect operational capabilities. Navy and Marine Corps operations that can be adversely affected by currents include swimmer operations, small boat operations and mine deployment.

This project is designed as a 2-year effort. The first year's effort will be devoted to reduction and analysis of previously acquired data, field experiment design and preliminary model construction. The field phase of the project will take place in FY 1976 on Grand Cayman Island. Regional and mesoscale currents will be measured through the use of radar-tracked drogues. Shelf and microscale currents will be monitored with ducted impeller meters, electromagnetic current meters, and bottom drifts. Sediment distribution and transport will be determined by using tagged sediment samples, shallow seismic devices and extensive high-altitude and satellite imagery.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0031, EQUATORIAL WAVES DRIVEN BY CONVECTION
D.D. RODENHUIS, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740

The objective of the proposed research is to develop and test new schemes of parameterization of cumulus convection and the interaction with wave motions in equatorial latitudes. Specific studies will include: (1) The analysis of free modes and stability of equatorial waves in horizontal shear flow plus incorporating a CISK mechanism. (2) The development and testing of an improved convection model with entrainment and evaporation of precipitation using jointly the Asai- Karahara model and the CISK hypothesis. (3) The testing and evaluation of parameters in wave interaction models with existing data from satellite and tropical experiments.

SUPPORTED BY U.S. Natl. Science Foundation

5.0032, EVALUATION OF EMPIRICALLY-DERIVED CALCULATION TECHNIQUE FOR ARCTIC ICE THICKNESS USING AIRBORNE IR IMAGERY AND OTHER FIELD DATA

L.A. LESCHACK, Development & Reso. Trans. Co., *Silver Spring, Maryland* 20902 (7-233; 5-35403)

Objective: To verify empirical relationships between IR radiation values and ice thickness for use in developing automated ice mapping techniques.

Approach: Remotely sensed IR radiometer and visible region imagery will be acquired from aircraft and satellites (NOAA, ERTS) concurrent with surface data during the April 1975 AIDJEX (Arctic Ice Dynamics Joint Experiment) in the Bering Sea. NOAA and NASA will provide G.F.E. data from an airborne IR scanner, a nadir looking IR radiometer, aerial cameras, ERTS multiband imagery, the NOAA VHRR, Ice Observer Log Data, and surface meteorological information. The contractor will examine the radiometer temperature distributions for various ice types. Histograms of radiance from several sites will be compared to the ice thickness measurements at these sites. Electronic density slicing analyses of imagery will be made from NOAA ERL instrumentation. A report on the results of ice thickness/IR radiance correlation will be made.

Progress: Evidence of the IR radiance/ice thickness correlation was found by LeSchack from March 1971 AIDJEX data.

Future plans: Verification of this ice thickness measuring technique will permit future plans to apply the technique to automated ice mapping.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0033, DESIGN OF THERMAL FOG DISPERSAL

B.A. KUNKEL, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF243830)

AF function - navigation, weapons delivery and command and control. Deficiency or opportunity - lack of a capability to dissipate the warm fog and stratus over airfields that interferes with the accomplishment of these functions. Objective - optimize the design of thermal fog dispersal systems. How development contributes - permits the engineering development of cost-effective and efficient thermal fog dispersal systems for major Air Force bases.

The final phase of an interactive program of model and field experimentation on heat/momentum systems will be conducted. The temperature and wind flow fields generated by a sub-scale configuration of momentum-driven heat sources under various meteorological conditions will be measured and analyzed. The orientation, spacing, and heat and momentum outputs of the sub-scale combustors will be varied during the experiments. Combustor configurations for the approach and rollout zones of a runway will be simulated. An analytical model of the heat/momentum system will be developed to permit an understanding and generalization of the empirical results. The empirical data will be used to verify and improve the model. The models, in turn, will be used to extrapolate the sub-scale experimental results to the design of full-scale systems. This effort will result in the determination of the technical specifications of the most efficient and least costly combustor for thermal fog dispersal system.

Supporting agency address information: AF Cambridge Research Laboratories LY, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0034, FREE BALLOON INSTRUMENTATION

H. LAPING, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF243940)

AF function - advanced balloon systems (surveillance, delivery operations, environmental research support, space equipment test). Deficiency - an economical, accurate global balloon tracking capability does not exist. Objective - develop a VOR balloon tracking capability for the continental United States and an Omega balloon tracking capability suitable for worldwide use. How research contributes - positive free balloon tracking, on a worldwide basis, will be possible. The accuracy and timeliness of the position information will be such as not only to satisfy both civil and military air safety requirements, but also to provide a reliable economical method to track free balloon flights over remote or inaccessible areas.

Final test flights will be conducted to confirm accuracies attainable using the VOR free balloon tracking equipment. Two test flights of a prototype Omega signal processor will be conducted over the continental United States. Data from these flights will be studied to evaluate operational problems, signal quality and comparative position accuracy with respect to vor and radar.

Supporting agency address information: AF Cambridge Research Laboratories LC, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0035, SATELLITE DATA ANALYSIS

F.W. WARD, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244900)

AF function - weather observing, analysis and forecasting for military operations. Deficiency - lack of adequate information to meet military weather support requirements. Objective - to develop techniques and equipment to exploit the full potential of meteorological satellites for military weather support. How development contributes - provides the hardware and software for an improved weather analysis and forecasting system that is independent of geopolitical constraints.

Satellite data are compared with simultaneous aircraft observations to determine to what extent the former can substitute for the latter in meteorological analysis and forecasting. A study has been initiated in which aircraft temperature soundings and particle counts are compared with soundings obtained from infrared measurements on satellites to determine if ceiling and visibility can be specified from satellite data. Wind reports are related to satellite-observable features of tropical storms in order to develop a systematic method of defining the wind field within storms.

Supporting agency address information: AF Cambridge Research Laboratories LY, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0036, MICROWAVE SPECTROMETER FOR METEOROLOGICAL OBSERVATIONS FROM SATELLITES

UNKNOWN, Mass. Inst. of Technology, Graduate School, *Cambridge, Massachusetts* 02139 (NAS 5-22485; 639-10-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0037, AIRBORNE MAPPING OF WATER CHARACTERISTICS

P.G. HASELL, Environmental Res. Inst. Mich., *Ann Arbor, Michigan* 48107 (7-713; 04-5-158-58)

Objective: To investigate the feasibility of mapping chlorophyll content of lake and ocean surface waters using quantitative spectral signatures from airborne multispectral sensors.

Approach: Personnel, facilities, and materials will be provided by the Environmental Research Institute of Michigan (ERIM) to fulfill the following tasks: a) Modify the (contractor's) airborne electronic scanner to provide twelve 200 Angstrom channels at visible and infrared wave lengths and install the scanner and a 4-band camera on the ERIM aircraft. b) The modified scanner and aerial camera systems will be flown over selected test sites in Lake Michigan and along the Pacific coast near La Jolla, California. c) Film and electronic scanner data from the Lake Michigan and Pacific Coast flights will be processed and turned over to personnel designated by the NOAA/NESS SPOC Group for analysis. d) A report on the flight data records and narrative account of the flight data records should be supplied with the data. e) Surface data at the Great Lakes and Pacific test sites will be collected by personnel designated by the NOAA/NESS SPOC Group.

Future plans: Scanner data will be processed and analyzed to determine the success of airborne measurement of water characteristics. Relationships between chlorophyll concentrations and the second derivative of the reflectance spectra will be in-

vestigated using surface truth data obtained by Scripps Oceanographic Institution at the west coast test sites.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0038, STRATOSPHERIC PHYSICS AND CHEMISTRY WORKSHOP
UNKNOWN, Univ. of Michigan, Graduate School, *Ann Arbor, Michigan* 48104 (NAS 5-22441; 185-47-52)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0039, INTERPRETATION OF PROPERTIES OF PRINCIPAL MINNESOTA SOIL SERIES
R.H. RUST, Univ. of Minnesota, Agricultural Experiment Sta., *St. Paul, Minnesota* 55101 (0001806; MIN-25-018)

OBJECTIVE: Develop, from available data, interpretive classifications of land for a variety of uses - agriculture, forestry, residential and industrial development, recreation, and transportation.

APPROACH: The principal effort would be in development of information retrieval and display systems--tabular and graphic--or original and derived data correlated with the specific interpretation. Means or methods would be developed to provide 'instant' or 'on line' interpretations at several generalizations so as to serve the needs of the individual developer or manager, as well as the large-scale regional planner. The recent developments in computer 'visigraphics' would be investigated for application.

PROGRESS: Effort was made to use special NASA photoimagery (color-infrared) to delineate soil areas in the Red River Valley with calcium concentrations in or near the surface. A transect across southern Norman County was selected for ground truth observations to compare to density sliced imagery. It was concluded that in this area, with early summer photography, it was possible to improve the quality of map delineations and to derive quantitative estimates of the occurrence of these soils (Calciaquolls). A related effort was made in the northern part of the Red River Valley to delineate areas of saline soils using medium and low altitude color and color-infrared photography and employing density slicing. Transect areas were selected in Kitson County. Soil samples were taken for conductivity measurements and field observations made on smallgrain. A preliminary conclusion was that, with color-infrared photography taken at 'maximum green,' i.e., about end of July, areas of saline-affected soils could be identified and quantified. This interpretation does not appear too reliable on fallow soils. With the continued development of the Minnesota Soil Atlas series maps (scale 1:250,000) and reports, a cooperative effort is underway with the Dept. of Geography effort into computer storage, by 40-acre cell units, not only soils and landscape information but also physical and chemical features, productivity estimates for crop and forest production, and suitability ratings for urban developments. Work on the development of Crop Equivalent Ratings for several counties with recently completed detailed soil surveys continues.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0040, AQUATIC PLANTS AS FILTRATION SYSTEMS FOR CHLORINATED HYDROCARBONS
F. SHORE, Jackson State University, School of Liberal Arts, *Jackson, Mississippi* 39217 (NSG 8026; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0041, EVALUATION AND MONITORING OF THE HYDROLOGIC IMPACT OF CABIN CREEK, B.C. COAL PIT MINING UPON THE NORTH FORK OF THE FLATHEAD RIVER
W.M. WEBER, Univ. of Montana, School of Arts & Sciences, *Missoula, Montana* 59801 (A-096-MONT)

The proposed research involved field investigation of the hydraulic geometry and fluvial geomorphology of the North Fork of the Flathead River and its principal tributaries in order to determine the relative state of watershed stability and sensitivity to influx of increased levels of suspended- and bed load which may result from the proposed coal pit mining and urbanization in the Cabin Creek, B.C. area. A network of channel geometry monitoring stations (Vigil Network) will be established to document biophysical 'baseline' conditions and will permit future monitoring of biophysical change at these recoverable stations.

Field investigations would include: 1. Surveying river profiles and cross-sections, 2. Surveying and describing Vigil Network sites (12), 3. Geomorphological mapping.

Office investigations would include: 1. Photogeologic mapping of the watershed on current (1974) air photos, 2. Interpretative analysis of 1932-1974 air photos to establish the hydrogeologic character and rates of change of channel morphology and pattern, 3. Integration of hydraulic goemetry data with U.S.G.S. gaging station data on stream flow, water quality, and suspended sediment load.

SUPPORTED BY U.S. Dept. of Interior - O.W.R.T.

5.0042, NONPOINT SOURCE WATER POLLUTION MONITORING APPROACHES AND TECHNIQUES
V.W. LAMBOU, U.S. Environ. Protection Agcy., Natl. Environ. Research Center, *Las Vegas, Nevada* 89114 (1HA326)

Objectives: Develop and assess ground and aerial monitoring techniques for nonpoint source pollution associated with extractive mining, emphasizing oil shale development.

Approach: Assess state-of-the-art monitoring techniques for specific pollution parameters related to extractive mining; conduct demonstration monitoring program associated with oil shale pilot plant development; develop application of aerial remote sensing techniques for monitoring feasible parameters.

Current Plans/Progress: Key pollutant parameter identification complete; preparation of remote sensing instrumentation criteria initiated; pilot plant demonstration study plans initiated.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0043, AERIAL MULTISPECTRAL TECHNIQUES IN SURVEYS OF WATER BODIES
A.E. PRESSMAN, U.S. Environ. Protection Agcy., Natl. Environ. Research Center, *Las Vegas, Nevada* 89114 (1HA325)

Objectives: Development of operational aerial multispectral scanner system for remote monitoring of water bodies.

Approach: Conduct ground and aerial experiments to develop spectral signatures of water pollution parameters; conduct atmospheric effect experiments to determine errors associated with absolute measurement and develop operational multispectral scanning system.

Current Plans/Progress: Calibration of prototype spectrometer in progress; parameter signature and error analysis experiments to be initiated in calendar year 1975.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0044, IDENTIFICATION OF OPTIMUM OVERHEAD MONITORING TECHNIQUES FOR OUTFALL DETECTION
A.E. PRESSMAN, U.S. Environ. Protection Agcy., Natl. Environ. Research Center, *Las Vegas, Nevada* 89114 (1HA325)

Objectives: Demonstrate program and production of standard operating procedure manuals for application of aerial remote sensing techniques for inventory of outfalls to water bodies.

Approach: Collect aerial remote sensor data over various categories of pollution outfalls for representative pollution sources in the U. S.; collate these data into an instruction and demonstration manual for use in operational environmental monitoring.

Current Plans/Progress: Aerial data partially collected; to be completed in early 1975.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0045, TURBULENCE DYNAMICS AND PREDICTABILITY
R.H. KRAICHNAN, Unknown Inst. or Indiv. Grant, *New Hampshire* (OCD75-15100)

The objective of this research is the application of analytical turbulence theory and statistical physics to the properties of turbulent flows of meteorological relevance. Emphasis will be on the following: (1) Sub-grid-scale representations - work will continue on improving or replacing conventional methods of accounting for motions smaller than the grid size in numerical calculations; (2) Predictability studies - continued efforts to formulate and use new measures of the growth of prediction error; (3) Dynamics of 2-dimensional turbulence - continued study of basic atmospheric turbulence with particular emphasis on the transfer of energy to larger spatial scales; (4) Compacted models of the full equations of fluid motion - an effort to optimize the numerical solution of the Navier-Stokes equation so that computations are minimized for results of given accuracy.

SUPPORTED BY U.S. Natl. Science Foundation

5.0046, SPRAY POND TESTING AND EVALUATION
R. STEWART, State University of New York, Atmospheric Sciences Res. Ctr., *Albany, New York* 12203 (ERG NO. 1678)

Description: The Atmospheric Sciences Research Center of the State University at Albany has performed tests of full-size sprays of the type which would be used in a power plant spray cooling system. This prior work consisted of experimental tests to measure the extent to which, under the type of meteorological conditions prevailing in New York, spray operation would create fogging conditions and to explore techniques to minimize and restrict such fogging if it were to occur. Based on the experimental data developed, an analysis will be made of the operating efficiencies and corresponding environmental impacts of such systems. The performance of spray cooling systems at locations important to generation facility development in New York will be assessed to identify the circumstances under which this technology offers economic and environmental advantages.

Telephone 0 of P. I. - 518-377-6477.

SUPPORTED BY New York State Government - Albany

5.0047, AERIAL INFRARED WATER TEMPERATURE SURVEY
R.H. TOURIN, State Atomic & Sp. Dev. Auth., *New York, New York* (ERG No. 1680)

Description: In cooperation with the New York State Department of Environmental Conservation, aerial infrared surveys are performed over the water-courses of the State to examine and record zones of interactions between cooling water discharges from neighboring power generating plants; discharges from plants with and without submerged discharge systems; water temperature measurements over tidal cycles for power stations on the Hudson Estuary; and water discharge temperature distribution during periods of minimum and maximum salt intrusion in the Hudson Estuary. There is special emphasis on observation of new plants operating for the first time.

Telephone 0 of P.I. - 212-689-5070.

SUPPORTED BY New York State Government - Albany

5.0048, INVESTIGATION OF THE INFLUENCE OF AEROSOLS ON THE STRATOSPHERIC NOX CYCLE
A.W. CASTLEMAN, Brookhaven Natl. Lab., *Upton, New York* 11973 (045067 (TRAIS NO.))

Work constitutes a study of the mechanisms by which nitric acid and nitrogen dioxide could be removed from the gas phase of the stratosphere by incorporation in and/or conversion to aerosol particles. The work will consist of two major phases: Phase I devoted to scoping work to identify the potentially important reactions leading to nitrogen oxides or nitric acid incorporation into particles, and Phase II devoted to measuring the requisite rates of the important steps in the mechanisms.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0049, TEST OF THE ERTS-DATA COLLECTION SYSTEM IN THE SUSQUEHANNA RIVER BASIN.
R.W. PAULSON, U.S. Dept. of the Interior, Geological Survey, *Harrisburg, Pennsylvania* 17104 (PA 73-051)

The potential use of earth-orbiting satellite data relay systems for flood warning has not been well explored.

The objective of this project is to test the Earth Resources Technology Satellite-data collection system on key stream gages in the Susquehanna River basin for flood warning.

Four data collection platforms will be field installed on stream gages in the basin. Data relayed from the gages will be provided to the Susquehanna River Basin Commission and the National Weather-Service's River Forecast Center in Harrisburg.

Data collection platforms were operated in 3 gaging stations in the Susquehanna River basin and data relayed through the ERTS satellite. Ball Bros. memory units were being tested on 2 DCP's in the basin as the FY ended.

The data collection platforms will be further tested in cooperation with the Susquehanna River Basin Commission. The Ball Bros. memory unit will be evaluated and the GOES system tested.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0050, APPLICATION OF HEAT FLOW-TEMPERATURE MODEL FOR REMOTELY ASSESSING NEAR SURFACE SOIL MOISTURE BY THERMOGRAPHY
J.A. TUNHEIM, South Dakota State University, Graduate School, *Brookings, South Dakota* 57006 (A-053-SDAK)

The proposed research involves theoretical and experimental investigations relating to the detection and mapping of near-surface ground water by the use of remote sensed thermal emittance. The general approach is to modify and use a heat flow model to predict surface temperature deviations due to the presence of near-surface water.

Field investigations will include the measurement of temperature profiles during the diurnal cycle together with water table depths and temperatures. These measurements will be taken in an area where two aircraft flights will be made under an existing contract for the collection of thermal emittance data. The field data and theoretical model developed in this project will be applied to the interpretation of the acquired thermal data. Recommendations will be made for scheduling and evaluating surface emittance data for application to the following areas: 1. The detection of saline seeps in their preemergence stages. 2. The mapping and monitoring of shallow aquifers. 3. Irrigation scheduling.

SUPPORTED BY U.S. Dept. of Interior - O.W.R.T.

5.0051, STUDY OF UTILIZATION OF SOLAR ENERGY FOR RESIDENTIAL HEATING AND COOLING APPLICATIONS
E.I. GRIGGS, Tennessee Technological Univ., School of Engineering, *Cookeville, Tennessee* 38501 (NAS 8-31564; 647-40-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0052, FABRICATION AND EVALUATION OF GALLIUM ARSENIDE SOLAR CELLS WITH SOLUTION-GROWN GERMANIUM DOPED P-REGION
K.L. ASHLEY, Southern Methodist University, Inst. of Technology, *Dallas, Texas* 75222 (NSG 1206; 506-16-13)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0053, COLLECTION AND CONCENTRATION OF SOLAR ENERGY USING FRESNEL TYPE LENSES
R.F. WILSON, Texas Southern University, School of Arts & Sciences, *Houston, Texas* 77004 (NSG 9029; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0054, BALLOON MONITOR AND RESEARCH PROGRAM
J. HUGHES, U.S. Navy, Office of Naval Research, *Arlington, Virginia* 22217 (036881 (TRAIS NO.))

The Office of Naval Research shall initiate and manage an Instrumental Balloon Monitoring and Research Program.
Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0055, COLLECTION, REDUCTION AND INTERPRETATION OF THE NEUTRAL THERMOSPHERIC AND EXOSPHERIC MEASUREMENTS
G.L. GOGLIA, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1207; 863-11-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0056, GLOBAL METEOROLOGY
R.J. REED, Univ. of Washington, School of Arts, *Seattle, Washington* 98105 (OCD72-01354 A03)
The objectives of the proposed research come under three categories: 1. Tropical meteorology. GARP Atlantic Tropical Experiment (GATE) and pre-GATE data will be used to (1) study mass, moisture, heat, and vorticity budgets of tropical disturbances with the purpose of gaining increased understanding of synoptic scale/convective scale interactions, and (2) develop a technique for inferring large-scale vertical motions in the tropics from satellite information. 2. Extended range prediction. Diagnostic studies of low frequency (10-60 day period) motions will be undertaken for the purpose of establishing an observational basis for the development of extended range prediction models. 3. Clear air turbulence. Routine tests of a method for predicting the large-scale occurrence of shear-induced CAT, and its intensity, will be undertaken.

SUPPORTED BY U.S. Natl. Science Foundation

5.0057, CONTINUATION AND SUPPLEMENT OF CASE STUDIES EMPLOYING SATELLITE INDIRECT SOUNDINGS
L.H. HORN, Univ. of Wisconsin, School of Natural Sciences, *Madison, Wisconsin* 53706 (8-612; 04-4-158-2)
Technical objectives: In this project case studies are conducted on the application of satellite (Nimbus-5 and -6) indirect soundings to improve the methods by which these soundings are incorporated into global numerical prediction models and with models employing a fine mesh grid. The amalgamation of satellite indirect soundings can lead to improved weather predictions by extending the length of forecasts and also provide more accurate short-term forecasts of small scale features missed by the present array of radiosonde stations. A dual goal is to use satellite derived data in various individual case studies to gain more knowledge of atmospheric structure and behavior. All this work can not be completed in one year but concentration will be on topics for which excellent data sets become available.
Approach: Case studies will be undertaken using Nimbus-5 (ITPR, NEMS) Nimbus-6 (HIRS) deduced temperatures to delineate meteorological phenomena. Proposed studies are (1) To use Nimbus-6 derived data (scan on) to build on prevous years' work in estimating wind fields. (2) To use Nimbus-6 data samples over the U.S. to describe both height and wind fields. (3) To compare Nimbus-6 data (over U.S.) with the NMC/LFM initialized data (based on the Flattery Hough scheme). (4) To obtain a suitable reference level for Nimbus-6 data. (5) Dependent on success of (4) to use Nimbus-6 data sample in a numerical model. (6) To use the sounding data array to improve the vertical resolution of the soundings. (7) To use sounding data to monitor the size and intensity of the circumpolar vortex. (8) To use satellite sounding data to further study jet stream phenomena.
Progress: Indirect soundings based on Nimbus-5 ITPR and NEMS data were used to construct hand-analyzed isentropic cross sections through three strongly baroclinic situations over North America (February 10, 1973, April 9 and 11, 1973). The 850 mb geostrophic wind and thermal wind relationship were then used to obtain the normal wind components. Similarly, normal wind components were derived from radiosonde data and comparisons were made. Both the satellite and Raob derived winds overestimated the observed wind speed maxima. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0058, ULTRAVIOLET STUDIES WITH THE DUTCH NATIONAL SATELLITE
B.D. SAVAGE, Univ. of Wisconsin, Graduate School, *Madison, Wisconsin* (NSG 7133; 385-41-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, HUMAN PERFORMANCE UNDER SELECTED ENVIRONMENTAL STRESSES
UNKNOWN, Univ. of California, Graduate School, *Davis, California* 95616 (NCA 2-80506; 970-21-14)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0002, ENVIRONMENTAL STRESS AND REGULATION OF ANDROGEN SECRETION
J.M. DAVIDSON, Stanford University, School of Medicine, *Palo Alto, California* 94305 (NAS 9-14716; 970-51-16)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0003, REGULATION OF ADRENAL GROWTH AND FUNCTION
UNKNOWN, Univ. of California, Graduate School, *San Francisco, California* 94122 (NCA 2-65502; 970-21-16)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0004, NON-INVASIVE TECHNIQUE FOR MEASUREMENT OF CARDIAC OUTPUT FOR SPACE SHUTTLE USE
L.E. FARHI, State University of New York, Graduate School, *Albany, New York* 12203 (NSG 9028; 970-51-14)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0005, SEPARATION OF LYMPHOCYTES BY ELECTROPHORESIS UNDER TERRESTRIAL CONDITIONS AND AT ZERO GRAVITY
A.L. RUBIN, Cornell University, School of Medicine, *New York, New York* 10021 (NAS 8-31513; 179-13-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0006, ROLE OF NATRIURETIC PEPTIDES IN THE REGULATION OF URINARY SODIUM EXCRETION
H.J. GITELMAN, Univ. of North Carolina, School of Medicine, *Chapel Hill, North Carolina* 27514 (NAS 9-14697; 970-51-16)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0007, FIELD STUDY OF C-141A JPA UTILIZATION
R.C. JOHNSON, U.S. Air Force, Human Resources Laboratory, *Dayton, Ohio* 45433 (DF227740)
The objectives of this effort are to determine the impact of job guide manuals (job performance aids for non-troubleshooting tasks) on organizational maintenance of the C-141A, the acceptance of the job guide manuals by technicians, and the logistics of using and updating the job guide manuals. The C-141A is the first major USAF system for which job guide manuals have been procured. Plans are to procure such manuals for additional USAF systems. Systematic data about the utility of the job guide manuals for the C-141A is desired by AFSC, AFLC and MAC in order to guide future procurements. The data also are desired for

effort under Project 1194 to evaluate technical data for troubleshooting.

A field test for the C-141A JPA's will be conducted at Charleston AFB and Norton AFB. The attitudes toward and acceptance of JPA's by technicians will be assessed by administering questionnaires to and interviewing technicians and supervisors and by observation of maintenance activities. The impact of JPA's on maintenance efficiency will be evaluated by comparing various measures of maintenance efficiency (such as manhours required to complete a given task) collected before and after introduction of JPA's. Logistic problems resulting from the introduction of JPA's will be assessed through observation and by interview with personnel responsible for maintaining the JPA's.

Supporting agency address information: AF Human Resources Laboratory ASR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0008, ANALYSIS OF SPONTANEOUS VESTIBULAR PRIMARY AFFERENT DISCHARGE FOLLOWING APPLICATION OF DRUGS
M.J. CORREIA, Univ. of Texas, School of Medicine, *Galveston, Texas* 77550 (NAS 9-14641; 970-51-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0009, EVALUATION OF PHYSIOLOGICAL RESPONSES AND DIAGNOSTIC CRITERIA FOR THE APPLICATION OF EXERCISE STRESS TESTING (ABBREV)
D. CARDUS, Baylor University, School of Medicine, *Houston, Texas* 77025 (NAS 9-14661; 970-51-14)

Evaluation of physiological responses and diagnostic criteria for the application of exercise stress testing within the biomedical space program.

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0010, BIOMEDICAL STUDY CONCERNING ABERRATIONS OF IMMUNOLOGICAL FUNCTIONS ASSOCIATED WITH SPACE FLIGHT
L.C. GENTRY, Baylor University, School of Medicine, *Houston, Texas* 77025 (NAS 9-14603; 948-60-91)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0011, BIO-TELEMETRY SYSTEMS IN CALVES WITH ARTIFICIAL HEARTS
UNKNOWN, Univ. of Utah, Graduate School, *Salt Lake City, Utah* 84112 (NCA 2-21601; 970-21-12)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0012, ANIMAL MODELS AND INSTRUMENTATION FOR QUANTITATIVE EFFECTS OF SPACE SICKNESS
UNKNOWN, Univ. of Virginia, Graduate School, *Charlottesville, Virginia* 22903 (NCA 2-25501; 970-21-45)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, APPLICATION OF AEROSPACE TECHNOLOGY TO THE MATHEMATICAL AND STATISTICAL CHARACTERIZATION OF RAILBED AND HIGHWAY GEOMETRICS
L.C. BELL, Auburn University, School of Engineering, *Auburn, Alabama* 36830 (NCA 8-109; 644-02-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0002, AUTOMATED COMPUTERIZED PATTERN RECOGNITION IN CYTOLOGY
P.H. BARTELS, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (NAS 9-14692; 970-51-15)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0003, REAL-TIME ANALYSIS OF WIDE-BAND DATA
UNKNOWN, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NCA 2-40503; 159-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0004, INVESTIGATION OF THE OPTIMIZATION OF PARAMETERS
UNKNOWN, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NCA-2-40504; 352-02-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0005, FEASIBILITY OF REAL TIME EMULATION
M.J. FLYNN, Stanford University, Graduate School, *Palo Alto, California* 94305 (DF041590; AF-AFOSR-2865-75)

The Air Force encounters severe problems when computer hardware is changed or updated, and the computer software is modified to operate on the new machines. This transition required extensive manpower. Recently several soft machine architectures have been introduced which may make it possible to emulate a variety of image machine languages on a single host processor. This study will investigate the feasibility of such real time emulation and to identify specific techniques on computer organization which are required as well as define critical problem areas.

Supporting agency address information: AF Office of Scientific Research NM, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

7.0006, STUDY OF NUMERICAL METHODS FOR ROTATIONAL FLOW
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45520; 502-07-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0007, RAMS
R.N. GRUBB, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8G17 12 53)

Project objective: Design and development, management of procurement and installation of the Data System for the NOAA P3D weather research aircraft.

Current year plan: Installation planning, equipment acceptance testing and system integration and aircraft installation. Computer program development.

Progress report: A contract has been placed for the majority of the data system. Aircraft installation planning is largely complete as far as the aircraft contractor interface is concerned.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

7.0008, EVALUATION OF ALTERNATIVE METHODS FOR MAINTENANCE AND DISSEMINATION OF ENGINEERING SOFTWARE
H.G. SCHAEFFER, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (NSG 1193; 506-17-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0009, PROGRAMMING CENTRAL COMPUTER COMPLEX (CCC)-NAS
J. TIPPETT, Internat. Bus. Machines Corp., *Gaithersburg, Maryland* 20760 (014763 (TRAIS NO.))

This project will provide digital programs which perform Air Traffic Control functions and system control for NAS Stage A Automation System. Programs include Flight Data and Radar Processing, Radar Data Processing Programs; in addition the contract provides for program maintenance and implementation of computer programs in the 20 air route traffic control centers. A special project providing for a flight data processing program and its installation for the United Kindom is provided by this effort.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

7.0010, APPLIED MATHEMATICS
G.F. CARRIER, Harvard University, School of Arts, *Cambridge, Massachusetts* 02138 (MPS75-15469)

This is a continuation of research previously supported under GP- 34723X2.

G. Carrier, and D. Anderson and four associates will continue their work on a wide range of topics in applied mathematics. Among those to be considered are: (1) geophysical fluid dynamics, (2) mathematical and computational tools for quantum chemistry, (3) astrophysics and other contexts where the dynamics of rarefied gases play a central role, (4) mathematical questions in plasma physics, (5) applied mechanics problems with a stochastic element, and (6) fracture mechanics, particularly phenomena in solid earth geophysics.

SUPPORTED BY U.S. Natl. Science Foundation

7.0011, COMPARATIVE ANALYSES ON GENETIC ALGORITHMS IN RELATION TO OTHER MULTIMODAL FUNCTION OPTIMIZATION TECHNIQUES
J.H. HOLLAND, Univ. of Michigan, School of Lit. Sci. & the Arts, *Ann Arbor, Michigan* 48104 (NSG 1176; 506-90-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0012, NUMERICAL MODELS OF OCEAN CIRCULATION
UNKNOWN, City University of New York, Graduate School, *New York, New York* 10031 (NAS 5-22392; 161-03-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0013, VISUAL STIMULATION STUDIES
UNKNOWN, Vassar College, Graduate School, *Poughkeepsie, New York* 12601 (NCA 2-23501; 970-21-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0014, REDUCED STATE FEEDBACK GAIN COMPUTATION
H. KAUFMAN, Rensselaer Polytechnic Inst., School of Engineering, *Troy, New York* 12181 (NSG 1188; 512-53-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0015, A COMPUTER PROGRAM TO USE EXPERIMENTAL PRESSURE MEASUREMENTS IN THE CALCULATION OF HEAT TRANSFER ON SHUTTLE-TYPE CONFIGURATIONS
F.R. DEJARNETTE, Univ. of North Carolina, School of Engineering, *Raleigh, North Carolina* 27600 (NSG 1191; 502-37-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0016, NUMERICAL STUDY OF SUPERSONIC TURBULENT FLOW OVER SMALL PROTUBERANCES
A. POLAK, Univ. of Cincinnati, Graduate School, *Cincinnati, Ohio* 45221 (NSG 1208; 502-37-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0017, PROGRAMMABLE DATA COLLECTION PLATFORM STUDY
R.W. ROCHELLE, Univ. of Tennessee, Graduate School, *Memphis, Tennessee* 38103 (NAS 5-22495; 644-04-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0018, TEXGAP COMPUTER PROGRAM
R.S. DUNHAM, Univ. of Texas, School of Engineering, *Austin, Texas* 78712 (NAS 8-31566; 984-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0019, STATISTICAL STUDY OF OZONE IN THE ATMOSPHERE
R.H. MYERS, Virginia Polytechnic Institute, Graduate School, *Blacksburg, Virginia* 24061 (NSG 1182; 506-26-30)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0020, FACULTY AND STUDENT RESEARCH PARTICIPATION IN APPLIED STATISTICS AT NASA/LRC
J.O. SAWYER, Mary Baldwin College, Undergraduate School, *Staunton, Virginia* 24401 (NSG 1209; 750-02-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0021, DEVELOPMENT OF A FLUIDIZED BED COMPUTER MODEL
C.Y. WEN, West Va. University, School of Engineering, *Morgantown, West Virginia* 26506 (NAS 3-19725; 770-18-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0022, STATISTICAL MODELING AND INFERENCE FOR ORIENTATION DATA
R.A. JOHNSON, Univ. of Wisconsin, School of Hum. & Soc. Sci., *Madison, Wisconsin* (NSG 1196; 506-90-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, OPTICAL INSTRUMENT DEFINITION STUDY FOR AMPS PAYLOADS
T.N. DAVIS, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701 (NAS 9-14845; 356-36-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0002, AN ELECTRON SPIN RESONANCE SPIN-LABEL STUDY
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Francisco, California* 94132 (NCA 2-60505; 192-55-64)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0003, IMAGE ENHANCEMENT AND CLASSIFICATION TECHNIQUES
UNKNOWN, Kansas State University, Graduate School, *Manhattan, Kansas* 66502 (NCA 2-63501; 650-60-10)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0004, CHARACTERIZATION OF HIGH ENERGY GAP SEMICONDUCTOR
H.C. GATOS, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 1190; 506-16-13)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0005, STUDY OF ATOM-RADICAL REACTION SYSTEM CAPABLE OF PROVIDING IN SITU MEASUREMENTS OF NO2, HO2, CLO, AND ERO
J.G. ANDERSON, Univ. of Michigan, Graduate School, *Ann Arbor, Michigan* 48104 (NSG 9031; 185-47-32)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0006, THEORETICAL STUDY OF TWO EXCITED ELECTRONIC STATES OF HYDROGEN MOLECULAR H2 ION
C.L. BECKEL, Univ. of New Mexico, School of Arts & Sciences, *Albuquerque, New Mexico* 87106 (NCA 5-41; 188-48-52)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0007, INTERFEROGRAM ANALYSIS OF PERIODIC SPECTRA
R.L. ARMSTRONG, New Mexico State University, School of Arts & Sciences, *Las Cruces, New Mexico* 88001 (NSG 3069; 505-03-41)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, GIANT PLANET MODELS
UNKNOWN, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NCA 2-40602; 196-41-67)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0002, PROTONS INTERACTION WITH THE ATMOSPHERIC GASES
R.H. HUGHES, Univ. of Arkansas, School of Arts & Sciences, *Fayetteville, Arkansas* 72701 (GA-41919)

Laboratory experiments will be conducted to obtain absolute cross- sections for the emission of selected features in atmospheric gases produced by proton and hydrogen atom bombardment. The energy range will extend approximately from 10 KeV down to about 100 eV. Cross sections for processes involving a proton-hydrogen beam are essential for a quantitative interpretation of auroral spectra produced by proton bombardment of the atmosphere.

SUPPORTED BY U.S. Natl. Science Foundation

10.0003, PHOTOMETRIC EXPERIMENT IN ANTARCTICA
S.B. MENDE, Lockheed Aircraft Corporation, *Palo Alto, California* 94304 (OPP 71-01668-A04)

The broad objectives of the photometric experiment in Antarctica remain unchanged and for this reason a copy of the summary sheet from last year is included. The photometer at Siple is being and will be used: 1) to monitor the natural aurora producing atmospheric precipitation and auroral environment as part of a large scale, multi- instrument, coordinated experiment, and 2) to detect artificially induced precipitation and to retrieve man-made VLF signatures from the photometric data. In a change of plans, the refurbishing maintenance of the photometer will be accomplished at Siple instead of returning the instrument to CONUS. An effort will be made to install a photometer at the northern geomagnetic conjugate of Siple; one of the first problems to be addressed would be that of the reported non-conjugacy of red-arcs. Reduction, interpretation and analysis of data collected in previous years (72 & 73 at Pole and 74 at Siple) will continue. The possibility of using the ratio of line intensities to determine the meridional profile of the type and energy flux of precipitation particles will be investigated. Continuous recording for long periods of time will provide information about the temporal variation of the meridional profile as a function of local time and solar activity. It is anticipated that, even though there was no storm in 1973 to compare to the August 1972 storm, because of instrumental improvements, installation of a plastic dome and improvement in temperature stabilization the 1973 South Pole data will provide a much clearer picture of auroral morphology. A new analysis technique which employs spectral scan intensity data instead of heretofore used maxima and minima data will be used to derive information about the Doppler profile of H Beta (4861A) and upper atmosphere temperature from 4278A N2 ion.

SUPPORTED BY U.S. Natl. Science Foundation

10.0004, SUPPORT FOR REDUCTION OF JOINT INFRARED AND COPERNICUS X-RAY OBSERVATIONS OF CYGNUS X-3
G. NEUGEBAUER, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NSG 7140; 385-41-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0005, THE MEASUREMENT OF ELECTRICAL CONDUCTIVITY IN THE STRATOSPHERE 12911-GS
P.R. WILLIAMSON, Univ. of California, Graduate School, *San Diego, California* 92038 (DA0L5570; DAHC04-75-G-0155)

To supplement balloon-borne mass spectrometer measurements in the stratosphere with electrical conductivity measurements. Taken together, the electrical conductivity and mass spectra data make possible a better intercomparison between total and Alaska. The conductivity data will be analyzed and will examine ion concentration, ion mobility, and ion conductivity. Additionally, for possible correlations with other simultaneous measurements only, models of measurements of the ionization production rate for energetic cosmic rays and bremsstrahlung x-rays will be developed. Measured atmospheric parameters. E work contributes to the US Army 'Combined Stratospheric Measuring Program' in support of ballistic missile defense systems, and in particular, to the chemical kinetic models of the stratosphere being developed by BRL.

The approach is experimental and theoretical. Electrical conductivity probes will be designed and fabricated for incorporation in the positive ion-negative ion mass spectrometer being developed at the University of Denver for flights in Texas.

Supporting agency address information: AMC Army Research Office, Box 12211, Research Triangle Park, N. C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

10.0006, NUMERICAL STUDIES OF EARLY PHASES OF PROTOSTELLAR EVOLUTION
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Francisco, California* 94132 (NCA 2-60504; 384-47-66)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0007, INTERPLANETARY AND MAGNETOSPHERE PHYSICS
D.S. EVANS, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8DJ40410)

Project objective: Using the particle data from the S3 satellite, members of this group have unambiguously identified the ion cyclotron resonant interaction as being the dominant process governing the loss of energetic trapped protons from the radiation belts during the discovery phase of a geomagnetic storm.

Current year plan: A numerical model which allows one to compute the character of the auroral electron precipitation has been devised. This model assumes that a DC potential difference exists along the high- altitude geomagnetic line of force as well as certain characteristics of the plasma sheet particle population. The model then computes the energy spectrum of precipitating electrons that appear at the top of the atmosphere. Remarkable agreement between features of the modeled beam and many features observed in the natural auroral electron beam have been obtained.

Progress report: The development of a flexible computer simulation of solar generated disturbances within the solar wind has been completed. This program has made it possible to realistically compare theoretically modeled disturbances with actual spacecraft solar wind observations. Such comparisons have in turn made it possible to infer the physical process by which solar flares and inhomogeneous 'fast stream-slow stream' interactions produce interplanetary disturbances which propagate toward the earth.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

10.0008, REDUCTION AND ANALYSIS OF DATA FROM THE USO-1 HIGH RESOLUTION ULTRAVIOLET SPECTROMETER EXPERIMENT
E.C. BRUNER, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302 (NAS 5-22409; 821-32-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0009, PLANETARY ATMOSPHERIC DYNAMICS PROGRAM
C. HARD, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302 (NAS 5-22440; 185-47-57)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0010, STUDY OF CEPHEI VARIABLE STARS AND LINE-PROFILE VARIATIONS IN CEPHEISTARS
J.R. LESH, Univ. of Denver, School of Arts & Sciences, *Denver, Colorado* 80210 (NSG 5069; 831-42-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0011, MAJOR AND MINOR ELEMENTS AND ISOTOPE ANALYSIS OF CHONDRULES, LITHIC FRAGMENTS AND THE MATRIX IN SELECTED CHONDRITES
K. FREDRIKSSON, Smithsonian Institution, *Washington, District of Columbia* 20560 (460109)

'Chondrules' are the fundamental constituents of the oldest known rocks, meteorites. Although some agreement has emerged (e.g., through lunar studies) about the processes involved (impacts) in the generation of chondrules and chondrites, little is known about the true bulk composition of chondrules or their parent material. Newly developed techniques, instrumentation and concepts for the analysis of individual chondrules, in order to relate them and meteorites in general to the early stages of the evolution of the solar system, will be employed. This work is a continuation and an extension of studies currently supported by SRF. It has been possible to extend our analyses to trace elements and istopes (ion probe techniques) and to include lithic fragments and the matrix in the chondrites under investigation.

SUPPORTED BY Smithsonian Institution

10.0012, STUDY THE EVOLUTION OF SOLAR ACTIVE REGIONS
A. KASTEN, Washington Technical Institute, Undergraduate School, *Washington, District of Columbia* 20008 (NCA 5-40; 188-38-52)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0013, INVESTIGATION OF STELLAR CHROMOSPHERES AND THE INTERSTELLAR MEDIUM WITH THE COPERNICUS SATELLITE
H.W. MOCS, Johns Hopkins University, Graduate School, *Baltimore, Maryland* 21218 (NSG 5067; 831-42-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0014, ANALYSIS OF A SATELLITE X-RAY DETECTOR
W.K. ROSE, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (NCA 5-6; 821-32-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0015, STUDY OF DIGITAL IMAGE PROCESSING OF ASTRONOMICAL SCENES
A. ROSENFELD, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (NCA 5-1; 868-13-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0016, ANALYZE INFRARED STELLAR SPECTRA
UNKNOWN, Jersey City State College, Graduate School, *Jersey City, New Jersey* 07305 (NCA 2-50501; 352-02-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0017, RESEARCH ON COMETS
V.H. REGENER, Univ. of New Mexico, School of Arts & Sciences, *Albuquerque, New Mexico* 87106 (NCA 5-31; 196-41-52)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0018, RESEARCH ON SOLAR PHENOMENA
V.H. REGENER, Univ. of New Mexico, School of Arts & Sciences, *Albuquerque, New Mexico* 87106 (NCA 5-32; 385-38-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0019, RESEARCH ON THE SOLAR MAGNETIC FIELD
V.H. REGENER, Univ. of New Mexico, School of Arts & Sciences, *Albuquerque, New Mexico* 87106 (NCA 5-33; 188-38-52)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0020, RESEARCH ON HYDROMAGNETIC PHENOMENA IN COMET TAILS
V.H. REGENER, Univ. of New Mexico, School of Arts & Sciences, *Albuquerque, New Mexico* 87106 (NCA 5-34; 188-38-52)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0021, RESEARCH OF PHOTOELECTRIC PHOTOMETRY OF THE VISIBLE COUNTERPARTS OF CELESTIAL X-RAY SOURCES
UNKNOWN, Univ. of New Mexico, Graduate School, *Albuquerque, New Mexico* 87106 (NCA 5-36; 385-38-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0022, USE OF MULTICHANNEL SPECTROMETER FOR SOLAR RESEARCH
W. HUME, New Mexico Inst. Min. & Tech., Graduate School, *Socorro, New Mexico* 87801 (NCA 5-48; 385-38-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0023, MAINTENANCE OF JOINT OBSERVATORY FOR COMETARY RESEARCH
W. HUME, New Mexico Inst. Min. & Tech., Graduate School, *Socorro, New Mexico* 87801 (NCA 5-43; 196-41-52)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0024, COMPARATIVE STUDY OF PLANETARY BOW SHOCKS AND MAGNETOSPHERES
P.L. AUER, Cornell University, School of Engineering, *Ithaca, New York* 14850 (NSG 7135; 188-36-55)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0025, REDUCTION AND ANALYSIS OF DATA FROM USO-1 GRAPHITE CRYSTAL X-RAY SPECTROMETER AND POLARIMETER EXPERIMENT
R. NOVICK, Columbia University, Graduate School, *New York, New York* 10027 (NAS 5-22408; 821-32-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0026, IDENTIFICATION OF SCIENTIFIC PROGRAMS TO UTILIZE THE SPACE ENVIRONMENT
R.M. NEREM, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (NSG 1212; 975-50-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0027, PHOTOMETRIC ANALYSES OF MARINER TO IMAGES OF VENUS AND MERCURY
UNKNOWN, Univ. of Pittsburgh, Graduate School, *Pittsburgh, Pennsylvania* 15213 (NSG 7147; 820-08-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0028, LUNAR SCIENCE IN THE UNIVERSITY GEOLOGIC CURRICULUM
J.W. HEAD, Brown University, Graduate School, *Providence, Rhode Island* 02912 (NASW 2827; 383-20-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0029, ANALYSIS OF ULTRAVIOLET STELLAR SPECTRA OBTAINED WITH SKYLAB EXPERIMENT S-C19
UNKNOWN, Univ. of Texas, Graduate School, *Austin, Texas* 78712 (NAS 8-31459; 357-48-04)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0030, REDUCTION AND ANALYSIS OF DATA FROM USO-1 SOFT X-RAY BACKGROUND EXPERIMENT
W.L. KRAUSHAAR, Univ. of Wisconsin, School of Letters & Science, *Madison, Wisconsin* 53706 (NAS 5-22410; 821-32-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GENERAL

11.0001, SELECTED STUDIES IN RESEARCH AND DEVELOPMENT MANAGEMENT TECHNIQUES
C.A. PEDERSON, Stanford University, Graduate School, *Palo Alto, California* 94305 (NAS 2-8898; 997-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0002, ATS USER EXPERIMENTS HISTORY
N.A. ENGLER, Univ. of Dayton, School of Arts & Sciences, *Dayton, Ohio* 45469 (NAS 3-19699; 644-04-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0003, APPLICATION OF FEATURE SELECTION
L.D. GUSEMAN, Texas A & M University System, School of Science, *College Station, Texas* 77843 (NAS 9-14689; 177-42-81)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N75-31001*+ National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 59, JULY 1975
Jul. 1975 108 p refs
(NASA-SP-7037(59)) Avail: NTIS HC $4.00 CSCL 01A

This bibliography lists 368 reports, articles, and other documents introduced into the NASA scientific and technical information system in June 1975. Author

N75-31002*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOLOGRAPHIC FLOW VISUALIZATION WITHIN A ROTATING COMPRESSOR BLADE ROW
William A. Benser Aug. 1975 11 p refs
(NASA-TM-X-71788; E-7622) Avail: NTIS HC $3.25 CSCL 20D

Rapid double-pulsed holographic techniques were used to visualize the shock configurations in the tip region of a lightly loaded, high tip speed fan stage. The holograms showed the passage shock emanating from the blade leading edge, a moderately strong conical shock originating at the intersection of the part span shroud leading edge and the blade suction surface, and a second conical shock originating at the intersection of the part span shroud and the blade pressure surface. Due to a limited viewing angle, the bow waves upstream of the rotor could not be observed, and only limited details of the trailing edge shocks were obtained. Reasonable details of the shock patterns were obtained from holograms which were made without extensive rig modifications. Results indicate that larger viewing windows and and holographic plates would permit a wider viewing angle and give much more coverage of the regions of interest. Also, shorter time delay for double-pulsed holograms is also desirable, and would minimize blade movement and give clearer holograms. Author

N75-31003# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
ASPECTS OF NON-DESTRUCTIVE INSPECTION IN RELATION TO SERVICE FAILURE ANALYSIS
E. A. B. DeGraaf 3 Feb. 1975 39 p refs
(NLR-MP-75005-U) Avail: NTIS HC $3.75

A number of aircraft component service failures are described. Inspection procedures, possible improvements in such procedures, and the possibility that changes in existing inspection procedures may lead to unexpected defect discoveries are contemplated. Increased effectiveness for nondestructive techniques used in nonclassical ways was discussed. Inspection techniques using fluids are shown to influence the subsequent analysis of a failure. ESRO

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N75-31004 Purdue Univ., Lafayette, Ind.
THEORY OF AN AIRFOIL EQUIPPED WITH A JET FLAP UNDER LOW-SPEED FLIGHT CONDITIONS Ph.D. Thesis
Francis Louis Addessio 1974 147 p
Avail: Univ. Microfilms Order No. 75-17143

A theory is developed for inviscid, incompressible flow past a thin airfoil equipped with a thin, part-span jet flap. The theory is capable of treating low-speed flight regimes where the induced aerodynamic field of the jet is not small. The resulting nonlinear problem is handled by treating the induced flowfields of the jet and the wing separately, obtaining the fully coupled solution in an iterative manner. Spanwise variation of the jet vortex strength is assumed to be elliptical in the analysis. Since the method considers the vorticity associated with the jet to be positioned on the locus of the jet, which is obtained in the solution, it is better able to evaluate subsidiary aerodynamic variables such as the downwash in regions aft of the wing as well as forces and moments on the wing. A lifting surface theory is incorporated for the aerodynamics of the wing. Dissert. Abstr.

N75-31005 Georgia Inst. of Tech., Atlanta.
ANALYTICAL AND EXPERIMENTAL AEROELASTIC STUDIES OF A HELICOPTER ROTOR IN VERTICAL FLIGHT Ph.D. Thesis
Kanivenahalli Nagaraja 1975 153 p
Avail: Univ. Microfilms Order No. 75-17491

The static aeroelastic analysis of a helicopter rotor blade is presented to study the elastic effects on inflow velocity distribution on the blade in hover or vertical flight. The elastic deformation in the analysis is generally found to increase the inflow velocity as compared to a rigid blade assumption. This increases the unsteady wake spacing in a flutter or response analysis. Torsion-bending free vibration characteristics of the elastic rotor blade are determined for the boundary conditions employed in the experimental program, using the transmission matrix method. These vibration characteristics and the available unsteady aerodynamic theory are used to obtain the response of the blade for an input excitation force. The dynamic response characteristics of the two elastic model blades are experimentally studied. Both the experimental and analytical response results for the speeds considered, show that there is an increase in positive aerodynamic damping with increase in speed except at certain speeds where the damped frequency ratio is near integer values. The damped frequency is generally found to increase with speed. Dissert. Abstr.

N75-31006*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN EXPERIMENTAL AND ANALYTICAL INVESTIGATION

OF AXISYMMETRIC DIFFUSERS
L. A. Povinelli 1975 15 p refs Presented at 11th Propulsion Conf., Anaheim, Calif., 29 Sep. - 1 Oct. 1975; cosponsored by AIAA and SAE
(NASA-TM-X-71786; E-8451) Avail: NTIS HC $3.25 CSCL 20D

A finite difference computer program for turbulent compressible flow was used to establish the performance of several diffuser shapes for experimental testing. The diffusers were designed to have a linear change in Mach number, a linear change in pressure, or a curvature fitted by a quadratic equation. Testing was performed with M = 0.1 to 0.9 with and without boundary layer bleed. Above M = 0.6, data were obtained with a normal shock upstream of the diffuser entrance. Peak static pressure recovery occurred with a diffuser inlet M0.75. The quadratic diffuser yielded the highest total pressure recovery. Author

N75-31007*# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.
UNSTEADY LOADS DUE TO PROPULSIVE LIFT CONFIGURATIONS Quarterly Progress Report, 1 Jul. - 30 Sep. 1975
Jeffrey B. Morton, John K. Haviland, George D. Catalano, and William W. Herling Sep. 1975 31 p ref
(Grant NGR-47-995-219)
(NASA-CR-143454; ESS-4043-108-75; QPR-7) Avail: NTIS HC $3.75 CSCL 01A

The flow of a jet over an airfoil representative of upper surface blowing was studied using laser techniques. Experimental techniques were developed for the investigation of unsteady pressures behind a cold model jet. Construction of a 1/4 scale model of the 'Beach' test configuration was completed along with construction of a portable detector. The portable detector is used in conjunction with a laser to measure jet flows during tests on the 'Beach' facility. The detector incorporates both optical and electronic components. Author

N75-31008*# North Carolina State Univ., Raleigh. Mechanical and Aerospace Engineering Dept.
DEVELOPMENT OF A COMPUTER PROGRAM TO USE EXPERIMENTAL PRESSURE MEASUREMENTS IN THE CALCULATION OF HEAT TRANSFER ON SHUTTLE-TYPE CONFIGURATIONS Final Report, 2 Jun. - 15 Aug. 1975
Fred R. DeJarnette 15 Aug. 1975 28 p refs
(Grant NsG-1191)
(NASA-CR-143476) Avail: NTIS HC $3.75 CSCL 20D

An algorithm is developed for fitting a smooth pressure distribution to experimental pressure data or pressures calculated from some other method at discrete positions on the body. Pressure data in meridional planes are curve fit by dividing the data into segments and using a new least-square cubic or a least-squares conic to fit the data in each segment. The circumferential variation of the pressure is obtained by fitting a Fourier cosine series through the values calculated in each meridional plane. First and second derivatives of the pressure in the longitudinal and circumferential directions are calculated at any position on the body. This method was used to surface fit experimental pressure data on the Viking Aeroshell. A subprogram was developed to use this pressure distribution in another computer program to calculate inviscid surface streamlines and heating rates. It was determined that modifications should be made to the heating program in order to make it compatible with input pressure distributions. Author

N75-31009*# Kanner (Leo) Associates, Redwood City, Calif.
CALCULATION OF THE FLOW OF A VISCOUS COMPRESSIBLE FLUID AROUND AN OBSTACLE OF PARABOLIC SHAPE
Roger Peyret and Henri Viviand Washington NASA Sep. 1975 12 p refs Transl. into ENGLISH from proceedings of 3d Intern. Conf. on Numerical Methods in Fluid Mech. (Paris), v. 2, 3-7 Jul. 1972 p 222-229
(Contract NASw-2790)
(NASA-TT-F-16558) Avail: NTIS HC $3.25 CSCL 20D

The second phase of a study devoted to numerical calculation of the steady state flow of a viscous compressible fluid about a finite parabolic obstacle is presented. Numerical solutions for Navier-Stokes equations are found. Author

N75-31010*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EXPERIMENTAL AERODYNAMIC CHARACTERISTICS OF VEHICLES TRAVELING IN TUBES
Donald W. Kurtz and Bain Dayman, Jr. 15 Jul. 1975 69 p refs
(Contract NAS7-100)
(NASA-CR-143490; JPL-TM-33-731) Avail: NTIS HC $4.25 CSCL 20D

A simplified theoretical model for a vehicle traveling through an unvented tube under equilibrium incompressible conditions was used to guide the test program, reduce the data, and determine the self-consistency of the results. The results were then used to establish values for the arbitrary coefficients in the theoretical model. Substantial progress was made in understanding the aerodynamic characteristics of vehicles traveling in tubes as exemplified by the good agreement of the theoretical model predictions with the experimental data throughout the Reynolds number range (three orders of magnitude, up to that for an actual full-scale system) and the many geometric variables tested. Author

N75-31011*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF FORWARD CONTOUR MODIFICATION ON THE AERODYNAMIC CHARACTERISTICS OF THE NACA 641-212 AIRFOIL SECTION
Raymond M. Hicks, Joel P. Mendoza, and Angelo Bandettini Washington Sep. 1975 76 p refs
(NASA-TM-X-3293; A-6018) Avail: NTIS HC $4.75 CSCL 01A

Two different forward contour modifications designed to increase the maximum lift coefficient of the NACA 64 sub 1-212 airfoil section were evaluated experimentally at low speeds. One modification consisted of a slight droop of the leading edge with an increased leading-edge radius; the other modification incorporated increased thickness over the forward 35 percent of the upper surface of the profile. Both modified airfoil sections were found to provide substantially higher maximum lift coefficients than the 64 sub 1-212 section. The drooped leading-edge modification incurred a drag penalty of approximately 10 percent at low and moderate lift coefficients and exhibited a greater nosedown pitching moment than the 64 sub 1-212 profile. The upper surface modification produced about the same drag level as the 64 sub 1-212 section at low and moderate lift coefficients and less nosedown pitching moment than the 64 sub 1-212 profile. Both modified airfoil sections had lower drag coefficients than the 64 sub 1-212 section at high lift coefficients. Author

N75-31012# Lockheed Missiles and Space Co., Palo Alto, Calif.
AERODYNAMIC FORCES ACTING ON A BODY OF REVOLUTION AND DETERMINATION OF THE SHAPE OF OPTIMAL BODIES IN HYPERSONIC NEWTONIAN AND RAREFIED GAS FLOWS
O. A. Levina 1975 7 p refs Transl. into ENGLISH from Vestn. Mosk. Univ. Ser. Mat. Mekhan. (Moscow), no. 3, 1975 p 113-120
Avail: NTIS HC $3.25; National Translation Center, John Crerar Library, Chicago, Ill. 60616

The frontal drag and lift coefficients were computed for hypersonic flow around bodies of revolution at diverse angles of attack in diffuse rarefied gas. Expressions were obtained which permit the computation of the coefficients for a number of geometric shapes as a function of the angle of attack. F.O.S.

N75-31013# Lockheed Missiles and Space Co., Palo Alto, Calif.
AXISYMMETRIC FLOW AROUND BODIES IN THE DEVELOPED CAVITATION MODE
E. L. Amromin and A. N. Ivanov 1975 7 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (Moscow), no. 3, 1975 p 37-42
Avail: NTIS HC $3.25; National Translation Center, John Crerar Library, Chicago, Ill. 60616

One of the integral equations methods used earlier for numerical computations of plane cavitational flow was examined. General reasoning about its application to compute axisymmetric flows is presented. This method is shown to be effective in the numerical computations of axisymmetric flows as well as in the analytical investigation of the curvature of the meridian section

of the cavern boundary near its point of separation from the body. Author

N75-31014# Politecnico di Torino (Italy). Ist. di Macchine e Motori per Aeromobili.

PRESSURE WAVES PROPAGATION THROUGH BLADINGS IN AXIAL FLOW COMPRESSORS

Maurizio Pandolfi and Luca Zannetti May 1974 32 p refs
(Publ-161) Avail: NTIS HC $3.75

Results of numerical computations of unsteady flow in axial turbocompressors are presented. The flow deflection by the blades and the axial propagation of pressure waves are considered in a model in which the actual blading is replaced by an infinite number of similar blades with zero thickness. This blading is in turn replaced by a field of forces chosen so as to satisfy the condition of tangency of the flow to the blades at each point. The equations of motion are detailed together with inlet and outlet boundary conditions, and conditions at the leading and trailing edges of the blades. ESRO

N75-31015# Politecnico di Torino (Italy). Ist. di Macchine e Motori per Aeromobili.

VORTICAL AND NONVORTICAL AXISYMMETRIC FLOWS IN DUCTS [FLUSSO ASSIALSIMMETRICO CON O SENZA VORTICE IN UGELLI]

Maurizio Pandolfi Jul. 1974 17 p refs In ITALIAN
(Publ-163) Avail: NTIS HC $3.25

The stationary flux in axisymmetric ducts was numerically investigated as the time asymptotic result of a transient using a Univac 1108 computer. The hyperbolic partial derivative equations were time integrated by a finite difference method. Special care was taken to correctly represent the boundary conditions on the duct walls or at entrance and exit. Results are given for subsonic or critical flow configurations with or without vortices. ESRO

N75-31016# Politecnico di Torino (Italy). Ist. di Macchine e Motori per Aeromobili.

NUMERICAL ANALYSES OF SWIRLING FLOWS IN DUCTS [ANALISI NUMERICA DI FLUSSI VORTICOSI IN UGELLI]

Giuseppe Bussi Jul. 1974 23 p refs In ITALIAN; ENGLISH summary
(Publ-166) Avail: NTIS HC $3.25

Steady axisymmetric swirling flows in ducts were analyzed by means of the numerical integration of the general equations of motion. Results obtained by the relaxation method are given in the case of a subsonic flow in a convergent-divergent nozzle with boundary value conditions of solid body rotation at the inlet and outlet boundaries. A comparison with results obtained with the hypothesis of radial equilibrium flow is shown.
Author (ESRO)

N75-31017# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.

HEAT TRANSFER DISTRIBUTIONS ON A 70 DEG DELTA WING WITH FLAP-INDUCED SEPARATION

A. J. Edwards Mar. 1975 48 p refs
(Contract MIN-DEF-AT/2037/105)
(IC-Aero-75-01) Avail: NTIS HC $3.75

An experimental study of heat transfer distributions on the compression surface of a 70 deg delta at 8.2 M and a free stream Reynolds number of 170000/in is presented. The tests were carried out in a hypersonic gun tunnel. The model used was a swept plain-cropped delta wing with 70 deg sweep. This had a trailing edge with incidence variable in 3 discrete steps between 10 and 30 deg. Emphasis is placed on the flow separation induced by a trailing-edge flap, which is shown to be strongly dependent upon transitional effects for these flow conditions. The experimental results are compared with pressure and flow visualization studies carried out on one delta wing (of 70 deg sweepback) with and without full-span trailing edge flaps.
ESRO

N75-31018# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.

APPLICATION OF SIMILARITY LAWS TO THE BLADE PASSAGE SOUND OF CENTRIFUGAL FANS

Wolfgang Neise 6 Mar. 1975 35 p refs Sponsored by Deut. Forschungsgemeinschaft.
(DLR-FB-75-30) Avail: NTIS HC $3.75; DFVLR, Porz, West Ger. DM 12.90

Similarity laws governing the harmonic part of the sound from centrifugal fans were studied. Measurements were made with two precisely similar fans having impellers of 140 mm and 280 mm diameter. The experimental apparatus used is in accordance with the in-duct method suggested in an International Organization for Standardization proposal. A product notation for the radiated sound pressure, which was introduced by Weidemann, is verified by the present experimental results. The experiments also prove that it is possible to extrapolate data from a model fan onto other geometrically similar fans.
Author (ESRO)

N75-31019# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

SOME EXPERIMENTS ON THE PERFORMANCE AND THE DRAG PENALTY OF VARIOUS DISTRIBUTED ROUGHNESS BANDS USED FOR BOUNDARY LAYER TRANSITION FIXING

J. J. Versmissen 10 Jan. 1974 21 p refs
(NLR-TR-74009-U) Avail: NTIS HC $3.25

Two different roughness materials are compared with respect to transition fixing ability and drag penalty. Roughness bands, installed on a two dimensional airfoil, were tested in the transonic test section of the pilot tunnel. Boundary layer and wake measurements, at M = 0.65, were carried out and evaluated. The discussion of the results includes a comparison with theoretical boundary-layer calculations and with qualitative experimental findings of other authors. The conclusion is that no noticeable difference in momentum thickness or wake drag occurs between effective ballotini or carborundum transition bands, provided the bands are narrow (2 mm) and sparsely (15%) covered with particles; this is in spite of the larger bandwidth and denser coverage of carborundum bands. The advantage of ballotini lies in an easier application and the possibility of a better reproduction of a given transition band. Some practical remarks on application and reproduction of roughness bands are included.
Author (ESRO)

N75-31020# Radio Corp. of America, Cape Kennedy, Fla.

STAPLETON LOGISTICS EXPERIMENT

H. E. Reed 8 Jul. 1974 11 p
(Contract F08606-72-C-0029)
(AD-A008646; RCA/TELTA-TR-74-062; AFETR-TR-75-24)
Avail: NTIS CSCL 01/3

On 1 May 1974 the Range Measurements Laboratory (RML) conducted a feasibility demonstration using a Family II 200,000 cubic foot aerodynamic shape balloon system in a logistics scenario. The purpose of this demonstration was to evaluate the use of an aerodynamic balloon system in a low altitude heavy lift configuration. Additionally, the control/coordination problems associated with the use of two single drum balloon winch systems were evaluated. These winch systems were located 1500 feet apart and were used to maneuver the balloon and its payload. The Family II balloon was used to transport a MILVAN container from one location to another over a distance of approximately 1500 feet. The MILVAN was deposited at this new point, picked up and then transported to and positioned on a flatbed trailer. GRA

N75-31021# Radio Corp. of America, Cape Kennedy, Fla.

POWER AND TETHER SYSTEMS (PATS) PROGRAM Final Report

C. H. Duggins 4 Sep. 1974 53 p refs
(Contract F08606-73-C-0041)
(AD-A008713; RCA/TELTA-TR-74-064; AFETR-TR-75-25)
Avail: NTIS CSCL 01/3

Various power systems adaptable for use with tethered balloons are reviewed and discussed. The advantages and problems of two systems recommended for further study are discussed. Results of tests of a new type of tether material are given. Results of tests of a tubular tether fuel supply concept are given. GRA

N75-31022# Radio Corp. of America, Cape Kennedy, Fla.

BALLOON ARMAMENT TEST Final Report

Fred Minning, Jim Sechrist, and H. E. Reed 24 Jun. 1974 67 p
(Contract F08606-74-C-0025)
(AD-A008652; RCA/TELTA-TR-74-061; AFETR-TR-75-19) Avail: NTIS CSCL 01/3

The Balloon Armament Test was conducted by the Range Measurements Laboratory at Cape Canaveral Air Force Station, Florida, on 22 and 23 May 1974, successfully demonstrating the feasibility of using a balloon system as the lifting device for a munitions high angle impact facility. A new all-weather, environmentally hardened 200,000 cubic foot balloon system with a triad tether system was used. The test was documented by photogrammetric and strip charts. Test data are presented to support the technical and operational feasibility of the Balloon Armament Test concept. A recommendation for a follow-on phase two test either at Eglin AFB, Florida or at the high angle impact facility, Sandia Laboratories, Albuquerque, New Mexico, is contained in Appendix II of this report. GRA

N75-31023# Air Force Academy, Colo. Frank J. Seiler Research Lab.
THE DYNAMICS OF A GROWING SEPARATED REGION ON AN AIRFOIL Final Scientific Report, Nov. 1972 - Feb. 1975
James D. Lang, Feb. 1975 117 p refs
(AF Proj. 7905)
(AD-A008773; SRL-TR-75-005) Avail: NTIS CSCL 01/1

At present little is known of the dynamics of a separating and reattaching flowfield. This unsteady flow topic relates to a wide range of aerodynamic problems such as dynamic stall and control-surface-buzz. A theory is developed which models separation bubble dynamics. It includes a quasi-steady model for the external shear-layer, and flow of mass within the bubble at a mean reversed-flow velocity. Pressure perturbations along the bubble are modeled also. The theory is based on experimental results for an airfoil with oscillating spoiler and flap. GRA

N75-31024# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 1 Final Flight Test Report
1 Feb. 1974 229 p
(Contract F33657-72-C-0201)
(AD-A006373; Rept-335-1044-Vol-1) Avail: NTIS CSCL 01/3

This document is the Final Flight Test Report of the 49 tests conducted to evaluate and improve the performance of the AQM-34 drone's drogue and mid-air retrieval system (MARS). The program included tests of non-gliding and gliding main canopies as well as several types of engagement and drogue canopies. Two major drogue design goals were achieved: (1) the elimination of drogue collapse due to twisted suspension lines was solved by incorporating a swivel between the drogue and the drogue's attachment point on the vehicle; (2) the flight demonstration of a 15.3-ft-diam. drogue for use on drones which weigh in excess of 2200 lb when coupled with the non-gliding MARS and 2600 lb when coupled with the gliding MARS was achieved. GRA

N75-31025# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 2, APPENDIX Final Flight Test Report
1 Feb. 1974 156 p
(Contract F33657-72-C-0201)
(AD-A006374; Rept-335-1044-Vol-2) Avail: NTIS CSCL 01/3

The report contains engineering statistical data retrieval from flight tests performed on a target drone aerial pickup parachute system. GRA

N75-31026# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 3, APPENDIX Final Flight Test Report
1 Feb. 1974 160 p
(Contract F33657-72-C-0201)
(AD-A006375; Rept-335-1044-Vol-3) Avail: NTIS CSCL 01/3
For abstract, see N75-31025.

N75-31027# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 4, APPENDIX Final Flight Test Report
1 Feb. 1974 158 p
(Contract F33657-72-C-0201)
(AD-A006376; Rept-335-1044-Vol-4) Avail: NTIS CSCL 01/3
For abstract, see N75-31025.

N75-31028# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 5, APPENDIX Final Flight Test Report
1 Feb. 1974 193 p
(Contract F33657-72-C-0201)
(AD-A006377; Rept-335-1044-Vol-5) Avail: NTIS CSCL 01/3
For abstract, see N75-31025.

N75-31029# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 6, APPENDIX Final Flight Test Report
1 Feb. 1974 201 p
(Contract F33657-72-C-0201)
(AD-A006378; Rept-335-1044-Vol-6) Avail: NTIS CSCL 01/3
For abstract, see N75-31025.

N75-31030# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 7, APPENDIX Final Flight Test Report
1 Feb. 1974 151 p
(Contract F33657-72-C-0201)
(AD-A006379; Rept-335-1044-Vol-7) Avail: NTIS
For abstract, see N75-31025.

N75-31031# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 8, APPENDIX Final Flight Test Report
1 Feb. 1974 175 p
(Contract F33657-72-C-0201)
(AD-A006380; Rept-335-1044-Vol-8) Avail: NTIS CSCL 01/3
For abstract, see N75-31025.

N75-31032# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 9, APPENDIX Final Flight Test Report
1 Feb. 1974 159 p
(Contract F33657-72-C-0201)
(AD-A006381; Rept-335-1044-Vol-9) Avail: NTIS CSCL 01/3
For abstract, see N75-31025.

N75-31033# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 10, APPENDIX Final Flight Test Report
1 Feb. 1974 141 p
(Contract F33657-72-C-0201)
(AD-A006382; Rept-335-1044-Vol-10) Avail: NTIS CSCL 01/3
For abstract, see N75-31025.

N75-31034# Pioneer Parachute Co., Inc., Manchester, Conn.
AQM-34 DRONE MID-AIR RETRIEVAL PARACHUTE SYSTEM, VOLUME 11, APPENDIX Final Flight Test Report
1 Feb. 1974 154 p
(Contract F33657-72-C-0201)
(AD-A006383; Rept-335-1044-Vol-11) Avail: NTIS CSCL 01/3
For abstract, see N75-31025.

N75-31035# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
A LIBRARY OF COMPUTER PROGRAMS IN FLIGHT VEHICLE TECHNOLOGY: 1973
Ronald P. Meyers Apr. 1974 284 p
(AD-780658; AFFDL-TR-74-26) Avail: NTIS HC $8.75 CSCL 01/3

Computer programs useful in the design of flight vehicles are presented. Technical areas covered include: structures, vehicle dynamics, crew escape, prototype development, aerodynamics, flight control, and landing gear subsystems. Author (GRA)

N75-31036# ARO, Inc., Arnold Air Force Station, Tenn.
TEST MECHANISM FOR MEASURING PITCH DAMPING DERIVATIVES OF MISSILE CONFIGURATIONS AT HIGH ANGLES OF ATTACK Final Report for 19 Dec. 1974
Bob L. Uselton and James C. Uselton AEDC May 1975 32 p refs Sponsored by the AF
(AD-A009865; ARO-VKF-TR-75-11) Avail: NTIS CSCL 16/4

Pitch-damping tests were conducted at free stream M = 1.96 to evaluate the high-alpha missile test mechanism. Data were obtained utilizing the small-amplitude free-oscillation technique at angles of attack from -12 to 86 deg at Reynolds numbers, based on model diameter, of 86,000 and 187,000. Two missile configurations having length-to-diameter ratios (l/d) of 10 and 15 were tested. The l/d = 10 configuration is commonly known as the basic finner. The test mechanism proved capable of measuring the pitch derivatives. Strut interference was not appreciable. The derivatives were found to be nonlinear functions of angle of attack, and previously published data at low angles of attack well with the present results. Author

N75-31037# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Mechanical Engineering.
GORE PANEL STRESS ANALYSIS OF HIGH ALTITUDE BALLOONS
Harold Alexander and Purushottam Agrawal Oct. 1974 57 p refs
(Contract F19628-72-C-0100; AF Proj. 7659)
(AD-A009627; ME-RT-74013; SR-2; AFCRL-TR-74-0597) Avail: NTIS CSCL 01/3

A method for determining the stress state of a balloon gore panel is presented. It is assumed that the load tapes take the zero circumferential stress design shape and the gores bow out between the tapes. Using experimentally determined constitutive relations for the film and the load tapes both the circumferential and meridional stresses in the gore panel have been determined at all altitudes from launch to ceiling. GRA

N75-31038# Chrysler Corp., New Orleans, La. Data Management Services.
THE AERODYNAMIC CHARACTERISTICS OF WRAP-AROUND FINS, INCLUDING FOLD ANGLE AT MACH NUMBERS FROM 0.05 TO 1.3
C. W. Dahlke and L. D. Flowers 20 Dec. 1974 519 p refs
(Contract DAAH03-74-C-0405; DA Proj. 1M2-62303-A-214)
(AD-A009735; DMS-AR-1024; RD-TR-75-19) Avail: NTIS CSCL 01/1

An experimental investigation was conducted in the transonic wind tunnel to study the aerodynamic characteristics of wrap-around fins. Wrap-around fins with leading edge sweep angle on straight and step down bodies were tested. One unswept fin was tested simulating various opening angles from 10 degrees beyond fully open to a folding angle of 112.5 degrees. Force and moment data were obtained at Mach numbers from 0.5 to 1.3 at angles of attack up to 14 degrees and roll angles from 0 to 67.5 degrees. The results of the test are presented in plotted form for the main balance and all four fin balances. GRA

N75-31039# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SOME AERODYNAMIC CHARACTERISTICS OF SUPERSONIC LIFTING BODIES Final Memorandum Report
Charles J. Nietubicz Mar. 1975 80 p
(AD-A009704; BRL-MR-2458) Avail: NTIS CSCL 01/3

Aerodynamic characteristics are presented for various lifting body configurations. Data were collected for an angle of attack sweep of -10 degrees to +10 degrees throughout a Mach number range of 1.5 to 4.0. The test Reynolds number per meter was 15,700,000. The data are presented as standard force coefficients which have additionally been transformed about a tunnel axis coordinate system to obtain lift and drag data. The normal force center of pressure was found to be invariant with angle of attack and Mach number for all configurations. GRA

N75-31040# Texas A&M Univ., College Station. Engineering Experiment Station.
A COMPUTER PROGRAM FOR PREDICTING AIRLOADS ON A SINGLE OSCILLATING ROTOR BLADE IN HOVER Interim Technical Report
Paul R. Schatzle and Balusu M. Rao Mar. 1975 23 p refs
(Contract DAHC04-74-G-0184)
(AD-A009791; TEES-3099-75-01; ARO-11695.1-E; ITR-1)
Avail: NTIS CSCL 01/1

A FORTRAN computer program is developed to predict the unsteady airloads on a single oscillating rotor blade in hover using the numerical lifting surface technique developed by Rao and Jones. A listing of the program is given as well as typical results for the aerodynamic derivatives for a range of Mach number, wake spacing, and frequency ratio. The aerodynamic derivatives are calculated with respect to the mid-chord position and may be referred to any other reference axis by a transformation also given in the report. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N75-31041*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SURVEY OF PROJECTED GROWTH AND PROBLEMS FACING AIR TRANSPORTATION, 1975 - 1985
Louis J. Williams and Ann Wilson Aug. 1975 16 p
(NASA-TM-X-62476) Avail: NTIS HC $3.25 CSCL 01C

Results are presented of a survey conducted to determine the current opinion of people working in air transportation demand forecasting on the future of air transportation over the next ten years. In particular, the survey included questions on future demand growth, load factor, fuel prices, introduction date for the next new aircraft, the priorities of problems facing air transportation, and the probability of a substantial change in air transportation regulation. The survey participants included: airlines, manufacturers, universities, government agencies, and other organizations (financial institutions, private research companies, etc.). The results are shown for the average responses within the organization represented as well as the overall averages. Author

N75-31042# Advisory Group for Aerospace Research and Development, Paris (France).
STORE SEPARATION
L. H. Schindel (Naval Surface Weapons Center, Silver Spring, Md.) Jun. 1975 109 p refs
(AGARD-AG-202; AGARDograph-202) Avail: NTIS HC $5.25

This AGARDograph is a systematic collection of experimental results for use by engineers and designers, limited to externally carried, unpowered, unguided stores. In the sections dealing with store trajectories, the physical situation is described, the method of solution is indicated, and the final results are presented. Emphasis is on store motion in traversing the parent aircraft flowfield, with criteria for safe separation and methods of calculating flight path. Windtunnel test techniques are described, and some information on flight testing is given. Analytical treatment is compared with flight and tunnel results. There are brief mentions of ejection systems and the effect of stores on aircraft performance. Author

N75-31043# Air Force Weapons Lab., Kirtland AFB, N.Mex.
COMBINED BIRD CONTROL TECHNIQUES AND ANALYSIS RELATIVE TO BIRD-AIRCRAFT STRIKE HAZARD (BASH) Final Report, May 1972 - May 1974
Jelle DeBoer, George E. Meyer, and Edwin Mattingly Apr. 1975 32 p refs
(AF Proj. 683L)
(AD-A010431; AFWL-TR-74-323) Avail: NTIS CSCL 01/2

All US Air Force bases have a potential for bird-aircraft

strike hazards. The seriousness of such a hazard is dependent on the following criteria existing in each specific airdrome environment, either singularly or in combinations: (1) number and/or size of birds in the environment; (2) time (day, month, season or year); (3) airdrome operation (mission); (4) control techniques enforced (direct or indirect). The report addresses problems encountered on four USAF bases, the recommendations made for direct control techniques, and the results obtained on some of these bases. The report stresses the importance of specificity associated with each Air Force operational problem involving bird hazards. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N75-31044 Clarkson Coll. of Technology, Potsdam, N.Y.
AN OPTIMIZATION APPROACH TO AUTOMATED AIR TRAFFIC CONTROL FOR UNSTRUCTURED AIRSPACE Ph.D. Thesis
Ronald George Gados 1975 197 p
Avail: Univ. Microfilms Order No. 75-16939

This paper describes a heuristic algorithm which automatically predicts and resolves air traffic conflicts in an unstructured, three dimensional airspace environment. The optimization algorithm incorporates the existing winds and the projected positions of other aircraft to determine a flight path by which each aircraft can safely pass through the Air Traffic Control system in a minimum amount of flight time. Dissert. Abstr.

N75-31045*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
ANALYTICAL EVALUATION OF ILM SENSORS, VOLUME 1 Final Report
Raymond J. Kirk Sep. 1975 527 p refs
(Contract NAS1-13489)
(NASA-CR-132687-Vol-1; F-2132-Vol-1) Avail: NTIS HC $12.50 CSCL 01E

The functional requirements and operating environment constraints are defined for an independent landing monitor ILM which provides the flight crew with an independent assessment of the operation of the primary automatic landing system. The capabilities of radars, TV, forward looking infrared radiometers, multilateration, microwave radiometers, interferometers, and nuclear sensing concepts to meet the ILM conditions are analyzed. The most critical need for the ILM appears in the landing sequence from 1000 to 2000 meters from threshold through rollout. Of the sensing concepts analyzed, the following show potential of becoming feasible ILM's: redundant microwave landings systems, precision approach radar, airborne triangulation radar, multilateration with radar altimetry, and nuclear sensing. Author

N75-31046*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
ANALYTICAL EVALUATION OF ILM SENSORS. VOLUME 2: APPENDICES
Raymond J. Kirk Sep. 1975 112 p refs
(Contract NAS1-13489)
(NASA-CR-132687-Vol-2) Avail: NTIS HC $5.25 CSCL 01E

The applicability of various sensing concepts to independent landing monitor systems was analyzed. Microwave landing system MLS accuracy requirements are presented along with a description of MLS airborne equipment. Computer programs developed during the analysis are described and include: a mathematical computer model for use in the performance assessment of reconnaissance sensor systems; a theoretical formulation of electromagnetic scattering to generate data at high incidence angles; atmospheric attenuation of microwaves; and microwave radiometry, programs J.M.S.

N75-31047*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE INFLUENCE OF RADIO ALTIMETER ERRORS ON PILOT PERFORMANCE DURING THE FINAL APPROACH AND LANDING PHASE OF AN RPV MISSION
James C. Howard Jul. 1975 18 p refs
(NASA-TM-X-62466; A-6219) Avail: NTIS HC $3.25 CSCL 17G

Due to the fact that remotely piloted vehicles (RPV's) are currently being flown from fixed base control centers, kinesthetic and real world peripheral vision cues are absent. The absence of these cues complicates the piloting task, particularly during the final approach and landing phase of a mission. The pilot's task is futher complicated by errors in the displayed altitude information. To determine the influence of these errors on pilot performance during the final approach and landing phase of a mission, an experiment was conducted in which pilot subjects were asked to fly a fixed base simulation of a Piper PA-30 aircraft, using degraded altitude information. For this experiment, the chevron component of the display configuration was driven by a radio altimeter. Four altimeters were used, each with a different error characteristic, but within the range specified for the Sperry series of radio altimeters. Results indicate that for range of errors considered, there is no significant difference in landing performance that can be attributed to errors in altitude information. Author

N75-31048*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF EXTERNAL DISTURBANCES AND DATA RATE ON THE RESPONSE OF AN AUTOMATIC LANDING SYSTEM CAPABLE OF CURVED TRAJECTORIES
Windsor L. Sherman Washington Sep. 1975 46 p refs
(NASA-TN-D-7971; L-10040) Avail: NTIS HC $3.75 CSCL 17G

The effects of steady wind, turbulence, data sample rate, and control-actuator natural frequency on the response of a possible automatic landing system were investigated in a nonstatistical study. The results indicate that the system, which interfaces with the microwave landing system, functions well in winds and turbulence as long as the guidance law contains proper compensation for wind. The system response was satisfactory down to five data samples per second, which makes the system compatible with the microwave landing system. No adverse effects were observed when actuator natural frequency was lowered. For limiting cases, those cases where the roll angle goes to zero just as the airplane touches down, the basic method for computing the turn-algorithm gains proved unsatisfactory and unacceptable landings resulted. Revised computation methods gave turn-algorithm gains that resulted in acceptable landings. The gains provided by the new method also improved the touchdown conditions for acceptable landings over those obtained when the gains were determined by the old method. Author

N75-31049# Mitre Corp., Bedford, Mass.
APPLICABILITY OF AIR TRAFFIC CONTROL SIMULATION MODELS TO VESSEL TRAFFIC SYSTEMS Final Report
R. W. Telsch Oct. 1974 54 p refs
(Contract DOT-CG-40204-A)
(AD-A009358; MTR-6777; USCG-D-30A-75) Avail: NTIS CSCL 13/10

The report summarizes an activity whose goal was to investigate existing Air Traffic Control (ATC) models and simulation facilities to determine their adaptability to Coast Guard simulations related to Vessel Traffic Systems (VTSs). A literature search and the author's familiarity with known models were used to narrow down the field to three simulation vehicles which were then studied in more depth. The three capabilities investigated in depth were those of the Federal Aviation Administration Digital Simulation Facility, The Transportation Systems Center (TSC) ROSS/ROSS-M model and the MITRE ATC simulation vehicle. GRA

N75-31050# Missouri Univ., Rolla. Dept. of Electrical Engineering.
GEOGRAPHIC ORIENTATION FOR LOW ALTITUDE AIRCRAFT USING HORIZON MATCHING Technical Report, 1 Mar. 1974 - 28 Feb. 1975

Gordon E. Carlson and Charles M. Bendit Apr. 1975 224 p refs
(Contract N00014-69-A-0141-0009; NR Proj. 387-076)
(AD-A009403; CSR-75-3) Avail: NTIS CSCL 17/7

A proposed system is described for obtaining aircraft navigation checkpoint information by performing on-board comparisons of sensed horizon profiles and stored reference horizon profiles. Two variations of the system are presented and analyzed for penetration missions where the aircraft pilot maintains low-altitude flight between ridges to obtain terrain masking. System parameters and computation implementations have been investigated by using terrain data obtained from topographic maps and performing simulation analyses. Results of these analyses are shown and used to investigate system feasibility and select the best parameter and computation implementation. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N75-31051*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND TUNNEL/FLIGHT DATA CORRELATION FOR THE BOEING 737-100 TRANSPORT AIRPLANE
Francis J. Capone Aug. 1975 18 p refs
(NASA-TM-X-72715) Avail: NTIS HC $3.25 CSCL 01C

A brief wind-tunnel/flight data correlation for the Boeing 737-100 airplane was made. The results showed excellent agreement between wind-tunnel and flight trimmed drag polars at Mach numbers less than 0.67. The wind-tunnel data predicted larger drag increments due to compressibility and a lift-curve slope about 9 percent higher than flight. Author

N75-31052# Aeronautical Research Labs., Melbourne (Australia).
AN INVESTIGATION OF THE FATIGUE PERFORMANCE OF THREE TYPES OF AIRCRAFT SKIN/SPAR BOOM FASTENING SYSTEMS. PART 1: CONSTANT-AMPLITUDE FATIGUE TESTS
J. Y. Mann and F. G. Harris Sep. 1974 55 p refs
(ARL/SM-Rept-350-Pt-1) Avail: NTIS HC $4.25

Constant-amplitude fatigue tests were carried out at mean stress levels of 4,000 and 10,000 psi (28 and 69 MPa) using multifastener specimens as part of an investigation into the efficacy of several fastener systems for attaching sheet material to a heavy extruded section. These included Parker-Kalon (PK) self-tapping screws, pinned Chobert blind rivets and BA screws. The PK screw fastener system indicated superior fatigue strengths compared with all the other systems investigated. They showed almost no tendency for the screws to loosen under fatigue loading, and exhibited considerably less scatter in endurance than the Chobert rivet system. Markedly different fatigue fracture characteristics were exhibited by divided sheet and full-sheet specimens, both as regards the fastener row at which the main fatigue fracture developed, and also the origins of the fatigue cracks within the fastener holes. Such differences could be relevant to the development of techniques and procedures for the detection and monitoring of small fatigue cracks. The data support the contentions that less scatter in endurance occurs under conditions of multiple fatigue crack initiation in the plane of fracture than under single origin conditions. Author

N75-31053# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
ESTIMATION OF THE AIRCRAFT STATE IN NON-STEADY FLIGHT
J. A. Mulder Oct. 1974 22 p refs Submitted for publication
(VTH-M-221) Avail: NTIS HC $3.25

Kalman filtering and smoothing and maximum likelihood estimation techniques were applied to the problem of estimating the aircraft state in nonsteady flight from onboard noisy inertial and barometric measurements. Applied to actual flight test data, the estimation schemes yielded similar results. Author (ESRO)

N75-31054# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
ADVANCED FLIGHT TEST INSTRUMENTATION: DESIGN AND CALIBRATION
R. J. A. W. Hosman Oct. 1974 18 p refs Submitted for publication
(VTH-M-222) Avail: NTIS HC $3.25

An instrumentation system for flight tests in nonsteady flight is described. The system comprises several high accuracy transducers and a high quality data logging system. The flight test method applied is based on deduction of aircraft performance as well as stability and control characteristics from measurements obtained during a nominally symmetric nonsteady maneuver. The maneuver is characterized by a nearly constant acceleration of the aircraft from low to high speed in a time interval of about 200 seconds. At more or less equal time intervals the aircraft is forced to oscillate about the lateral axis by manually controlled oscillations of the elevator. Stability and control characteristics are derived from measurements obtained during the aircraft's oscillations. Aircraft performance and the polar drag curve are determined from the quasi-stationary parts between the oscillations. Author

N75-31055# Ultrasystems, Inc., Phoenix, Ariz. Dynamic Science Div.
AIRCREW RESTRAINT SYSTEM: DESIGN CRITERIA EVALUATION Final Report, Apr. 1973 - Feb. 1975
Richard W. Carr and Stanley P. Desjardins Feb. 1975 162 p
(Contract DAAJ02-73-C-0050; DA Proj. 1F2-62209-AH-76)
(AD-A009059; Dynamic-Science-1680-74-115;
USAAMRDL-TR-75-2) Avail: NTIS CSCL 13/12

The objective of this program was to analyze, design, fabricate, and test an aircrew restraint system meeting the requirements of the proposed military specification. The development approach established was to make maximum use of existing hardware. The intent of the overall effort was to modify and refine the specification as necessary to define the requirements for an optimum restraint system that could be fabricated within the state of the art. GRA

N75-31056# Bell Helicopter Co., Fort Worth, Tex.
A NASTRAN VIBRATION MODEL OF THE AH-1G HELICOPTER AIRFRAME. VOLUME 1 Final Report, Jul. 1973 - Apr. 1974
James D. Cronkhite, Victor L. Berry, and John E. Brunken Jun. 1974 423 p refs
(Contract DAAF03-73-C-0122)
(AD-A009482; BHC-209-099-432-Vol-1;
RIA-R-TR-74-045-Vol-1) Avail: NTIS CSCL 01/3

This report documents a NASTRAN finite element model of the AH-1G helicopter airframe. The model was developed for the purpose of representing the low frequency vibration response of the airframe and the structure deflections due to weapon firing. The NASTRAN input data deck for the model is included in the documentation as well as a Normal Modes run on Level 15.1 of the program. The documentation is aimed at assuring that the government can independently use and modify the model to reflect actual or proposed changes in design. It is assumed that government personnel using this model and documentation have a good understanding of the NASTRAN computer program. GRA

N75-31057# Bell Helicopter Co., Fort Worth, Tex.
A NASTRAN VIBRATION MODEL OF THE AH-1G HELICOPTER AIRFRAME. VOLUME 2 Final Report, Jul. 1973 - Apr. 1974
James D. Cronkhite, Victor L. Berry, and John E. Brunken Jun. 1974 639 p refs
(Contract DAAF03-73-C-0122)
(AD-A009483; BHC-209-099-432-Vol-2;
RIA-R-TR-74-045-Vol-2) Avail: NTIS

This report documents a NASTRAN finite element model of the AH-1G helicopter airframe. The model was developed for the purpose of representing the low frequency vibration response of the airframe and the structure deflections due to weapon

firing. The NASTRAN input data deck for the model is included in the documentation as well as a Normal Modes run on Level 15.1 of the program. The documentation consists mainly of drawings and sketches of the idealized NASTRAN model with supporting instructions. In addition, the actual structure is identified and the idealization of the structure as a finite element model is explained. The NASTRAN input data deck serves as a major portion of the documentation. GRA

N75-31058# Boeing Vertol Co., Philadelphia, Pa.
BALLISTICALLY TOLERANT ROTOR BLADE INVESTIGATION Final Report
Edward T. Keast Apr. 1975 117 p
(Contract DAAJ02-73-C-0098; DA Proj. 1F1-63208-DB-52)
(AD-A009516; D210-10866-1; USAAMRDL-TR-75-4) Avail: NTIS CSCL 01/3

The objective of this program was to design and test rotor blades that are more tolerant of ballistic damage than current blades. Eight blade design concepts were conceived and compared with a previously tested baseline blade. Three of these concepts were selected for fabrication and were ballistically tested. Analysis of all hits showed a significant increase in survivability, as well as a penalty in blade weight, for each of the three designs. GRA

N75-31059# Technology, Inc., Dayton, Ohio.
FAIL-SAFE/SAFE-LIFE INTERFACE CRITERIA Final Report, Oct. 1973 - Oct. 1974
G. V. Feldt and S. W. Russell Apr. 1975 169 p refs
(Contract DAAJ02-74-C-0004; DA Proj. 1F1-62208-A-170)
(AD-A009519; USAAMRDL-TR-75-12) Avail: NTIS CSCL 01/3

Preparatory to developing fail-safe/safe-life design criteria for future helicopters, extensive literature and Go ernment/industry surveys were conducted to define and evaluate the related state of the art. After selected fail-safe/safe-life design methodologies were defined, they were applied to the main and tail rotor systems (specifically the blade, blade retention device, hub, and rotating controls), the fuselage, and the landing gear. Next, in cost and weight trade-off studies, various combinations of design criteria for redundant structures, controlled-fracture structures, and monolithic structures with slow crack growth were evaluated with respect to their technical feasibility. GRA

N75-31060# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
TIEDOWN AND BENCH TESTING OF GREASE-LUBRICATED HELICOPTER TAIL AND INTERMEDIATE GEAR-BOXES Final Report, Oct. 1972 - Nov. 1974
Bruce R. Simmons Apr. 1973 50 p
(Contract DAAJ02-73-C-00516; DA Proj. 1F1-63209-DB-38)
(AD-A009757; SER-50902; USAAMRDL-TR-75-11) Avail: NTIS CSCL 01/3

Experimental results are presented for modified, grease-lubricated H-3 intermediate and tail gearboxes operated on a regenerative test facility and an actual H-3 tiedown aircraft. The H-3 intermediate and tail gearboxes were suitably modified for operation with grease lubrication and utilized a lubricant conforming to specification MIL-G-83363 (USAF). A 10-hour bench test was conducted followed by a 50-hour tiedown test on an NSH-3A aircraft. GRA

N75-31061# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
FLIGHT EVALUATION: ROSEMOUNT ORTHOGONAL LOW AIRSPEED SYSTEM LOW AIRSPEED SENSOR Final Report, 24 Jan. - 9 Sep. 1974
Robert P. Jefferis, James C. OConnor, and Jerry R. Bullock Nov. 1974 48 p refs
(AD-A009711; USAAEFA-71-30-5; FR-5) Avail: NTIS CSCL 01/4

Tests were conducted on the Rosemount Engineering Company Model 853 orthogonal true airspeed sensor to determine its suitability for operational and flight test use as an airspeed system for helicopters. The sensor has no moving parts, and operates on the principle that differential pressures, measured between a pair of orthogonal chambers, are proportional to the airspeed in a given direction. Flight tests at Edwards Air Force Base, California, were started on 24 January 1974 and were continued as additional hardware became available. GRA

N75-31062# Technology, Inc., Dayton, Ohio.
DYNAMIC LOADS AND STRUCTURAL CRITERIA Final Report, Nov. 1973 - Oct. 1974
T. L. Cox, R. B. Johnson, and S. W. Russell Apr. 1975 199 p refs
(Contract DAAJ02-74-C-0017; DA Proj. 1F2-62208-AH-90)
(AD-A009759; USAAMRDL-TR-75-9) Avail: NTIS CSCL 01/3

Preparatory to developing mission profiles for future attack, crane, observation, assault, transport, and utility helicopters, the flight condition recognition (FCR) technique was applied to some 10-hour data samples for each of the following class-model helicopters which had acquired 200 or more hours of multichannel oscillograph data during operational usage surveys while the helicopters operated under combat conditions in Southeast Asia (SEA): attack - AH-1G, crane - CH-54A, observation - OH-6A, assault - UH-1H, transport - CH-47A, and utility - UH-1H. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N75-31063# Naval Electronics Lab. Center, San Diego, Calif.
A-7 ALOFT HARDWARE REQUIREMENTS ENVIRONMENTAL ANALYSIS
G. Holma 1 Apr. 1975 36 p refs
(AD-A009355; NELC-TD-418) Avail: NTIS CSCL 09/1

Environmental and operational testing of a fiber-optic interface was conducted to determine suitability of fiber-optic cables, connectors, and LED module for use aboard the A-7 aircraft. GRA

N75-31064# Beukers Labs., Inc., Bohemia, N.Y.
LOW COST ALTITUDE REPORTER Final Report, 1 Mar. 1973 - 30 Apr. 1975
Richard A. Bova and Christian B. Williams 30 Apr. 1973 61 p
(Contract N00014-73-C-0292)
(AD-A009896) Avail: NTIS CSCL 01/4

The scope of the work was to investigate the problems of low cost digital altitude reporting. Sensor investigation was included as well as the design of a suitable electrical interface. After testing of two types of pressure sensors, the aneroid capsule and the piezo resistive integrated circuit, a demonstration unit was fabricated and tested. GRA

N75-31065# Instrument Flight Center, Randolph AFB, Tex.
PILOT FACTORS FOR HELICOPTER PRE-EXPERIMENTAL PHASE Final Report
Gerald C. Armstrong, J. W. McDowell, Donald D. Sams, and F. J. Winter, Jr. Feb. 1975 20 p refs
(Contract F33615-73-C-3112; AF Proj. 8226)
(AD-A009839; IFC-TR-74-2) Avail: NTIS CSCL 01/3

An investigation was conducted to establish the methods and procedures to collect pilot factors information and to obtain firsthand pilot opinions and judgments concerning the present control-display systems installed in helicopters. Four instrument instructor pilots were used as test subjects and a total of seven data gathering sorties were accomplished. The profiles flown represented typical helicopter instrument maneuvers. The subject pilot activity required in performance of the maneuver segments was designed to progress from simple tasks to complex tasks. Objective and subjective data were obtained through the use of video, audio, and oscillograph recording equipment. GRA

N75-31066# Anacapa Sciences, Inc., Santa Barbara, Calif.
GENERALIZED TRAINING DEVICES FOR AVIONIC SYSTEMS MAINTENANCE Final Technical Report
Edward L. Parker Apr. 1975 86 p refs
(Contract N61339-73-C-0091)

(AD-A009805; AS-TR-164-1; NAVTRAEQUIPC-73-C-0091-1) Avail: NTIS CSCL 05/9

A research study was conducted to determine the feasibility and desirability of developing generalized training equipment for use in avionic systems maintenance training. The study consisted of a group of survey and analytic tasks which provided useful guidance to serve the needs of the Naval Aviation community in future years. The study had four specific objectives: (1) to assess the extent of maintenance task commonality existing among airborne weapons systems; (2) to identify new developments and design trends in avionics equipment; (3) to recommend the development of specific generalized training devices; and (4) to describe the general design characteristics of the training equipment recommended. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N75-31067*# Pratt and Whitney Aircraft, East Hartford, Conn.
SUMMARY AND ANALYSIS OF PERFORMANCE AND STABILITY CHARACTERISTICS OF THE REFAN JT8D-109 ENGINE
K. G. Sanberg, R. M. Mogielnicki, J. C. Davis, and V. M. Scaramella Sep. 1975 117 p
(Contract NAS3-17840)
(NASA-CR-134874; PWA-5284) Avail: NTIS HC $5.25 CSCL 21E

The refan JT8D-109 performance and stability characteristics are reported as determined from sea level testing, altitude testing, and DC-9 flight testing. The test results are summarized as follows: (1) TSFC at SLS achieved design goal of 12.66 percent reduction, (2) TSFC at altitude average cruise power 0.5 percent higher than design goal, (3) TSFC at altitude maximum cruise power 1.7-3.7 percent higher than design goal, (4) ground starting consistent with JT8D-9 base engine, (5) successful flight starts without starter assist, (6) transient surge margin equivalent to JT8D-9, (7) stable engine operation with inlet distortion, and (8) stable engine operation during snap acceleration and deceleration. A flight idle setting is required for acceptable aborted-landing go-around acceleration time due to increase in low-rotor moment of inertia, and a performance improvement program should be conducted as part of any future certification program. Author

N75-31068*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AERONAUTICAL PROPULSION
Washington 1975 476 p refs Conf. held at Cleveland, 13-14 May 1975
(NASA-SP-381) Avail: NTIS HC $12.00 CSCL 21E

Reports on the following technologies are included: engine design, exhaust gases, use of composites, bearings, and supersonic and hypersonic propulsion. For individual titles, see N75-31069 through N75-31082.

N75-31069* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PROPULSION SYSTEM NOISE REDUCTION
Charles E. Feiler, Laurence J. Heidelberg, Allan M. Karchmer, Donald L. Lansing, Brent A. Miller, and Edward J. Rice *In its* Aeron. Propulsion 1975 p 1-63 (For availability see N75-31068 22-07)
CSCL 21E

The progress in propulsion system noise reduction is reviewed. The noise technology areas discussed include: fan noise; advances in suppression including conventional acoustic treatment, high Mach number inlets, and wing shielding; engine core noise; flap noise from both under-the-wing and over-the-wing powered-lift systems; supersonic jet noise suppression; and the NASA program in noise prediction. Author

N75-31070* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
QCSSE PROGRAM
Carl C. Ciepluch *In its* Aeron. Propulsion 1975 p 65-80 (For availability see N75-31068 22-07)
CSCL 21E

The objectives, scope, and status of the NASA Quiet, Clean, Short-Haul Experimental Engine program are reviewed. The progress reported is concerned with engine design concepts for short-haul aircraft where part of the engine thrust is used to help lift the aircraft. Both under-the-wing, and over-the-wing configurations are discussed. Author

N75-31071* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REFAN PROGRAM
Robert W. Schroeder *In its* Aeron. Propulsion 1975 p 81-97 (For availability see N75-31068 22-07)
CSCL 21E

The JT8D Refan Program for noise reduction is outlined, and the overall objectives and program status, test results, and current noise level predictions are presented. Author

N75-31072* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTION AND EMISSIONS TECHNOLOGY
Jack Grobman, David N. Anderson, Larry A. Diehl, and Richard W. Niedzwiecki *In its* Aeron. Propulsion 1975 p 99-137 (For availability see N75-31068 22-07)
CSCL 21B

Combustor development is discussed as it relates to emissions reduction. The nature of the aircraft pollution problem is examined along with the aircraft pollution standards that have been established by the Environmental Protection Agency. The effect of engine operating conditions on pollutant formation levels is shown, as well as how close present-day engines are to meeting the established standards. The magnitude of the emissions reductions required to meet these standards is indicated. The progress that has been made in evolving the needed emissions reduction technology is the main topic. Author

N75-31073* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
UPPER ATMOSPHERE POLLUTION MEASUREMENTS (GASP)
Richard A. Rudey and James D. Holdeman *In its* Aeron. Propulsion 1975 p 139-156 (For availability see N75-31068 22-07)
CSCL 13B

The environmental effects are discussed of engine effluents of future large fleets of aircraft operating in the stratosphere. Topics discussed include: atmospheric properties, aircraft engine effluents, upper atmospheric measurements, global air sampling, and data reduction and analysis F.O.S.

N75-31074* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUEL-CONSERVATIVE ENGINE TECHNOLOGY
James F. Dugan, Jr., John E. McAulay, Thaine W. Reynolds, and William C. Strack *In its* Aeron. Propulsion 1975 p 157-190 (For availability see N75-31068 22-07)
CSCL 21E

Aircraft fuel consumption is discussed in terms of its efficient use, and the conversion of energy from sources other than petroleum. Topics discussed include: fuel from coal and oil shale, hydrogen deficiency of alternate sources, alternate fuels evaluation program, and future engines. F.O.S.

N75-31075* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPOSITES FOR FANS AND COMPRESSORS
Tito T. Serafini *In its* Aeron. Propulsion 1975 p 191-208 refs (For availability see N75-31068 22-07)
CSCL 11D

The composites research being conducted at Lewis for the application of composite materials to fan and compressor blades,

is reviewed. The major areas discussed include the development of improved materials and fabrication methods, recent progress in providing composite fan and compressor blades with improved resistance to foreign object damage, and the development of advanced design and analysis procedures for composite blades. Author

N75-31076* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBINE MATERIALS AND LIFE PREDICTION
Hugh R. Gray *In its* Aeron. Propulsion 1975 p 209-288 refs (For availability see N75-31068 22-07)
CSCL 11F

The recent developments and future potential of advanced materials for turbine components are described. The components discussed in detail are disks, blades, and vanes. Author

N75-31077* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BEARINGS AND GEARS FOR ADVANCED TURBINE ENGINES AND TRANSMISSIONS
Richard J. Parker *In its* Aeron. Propulsion 1975 p 289-303 (For availability see N75-31068 22-07)
CSCL 21E

The improved technology is discussed of engine main-shaft ball bearings, and spur gears in power transmission drive trains. Much of the technology can be applied to other ball and roller bearings, and to other spur and bevel gears throughout the engine, drive train, and accessory systems. Author

N75-31078* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENGINE SEALING AND LUBRICATION SYSTEMS
John Zuk *In its* Aeron. Propulsion 1975 p 305-327 refs (For availability see N75-31068 22-07)
CSCL 21E

Engine sealing programs are discussed which are directed toward the two major classes of engine seals: engine shaft seals and primary gas path seals. In addition, some concepts and results from fundamental lubrication research, as it pertains to the lubrication of bearings, are presented. Author

N75-31079* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENGINE SYSTEMS TECHNOLOGY
Ross Willoh, Edwin J. Graber, Fred Teren, and Robert E. Coltrin *In its* Aeron. Propulsion 1975 p 329-385 refs (For availability see N75-31068 22-07)
CSCL 21E

Current full-scale engine development programs are discussed, and efforts to improve the available technology base are presented. The Lewis full-scale engine test facilities are described. Several typical engine programs and plans for research in aeromechanical instability or flutter are summarized. An overview of Lewis studies of flow distortion and its effects on engine stability is presented. The origins and nature of the distortion problem are summarized, and some of the results and methods for both steady and time-varying distortions are discussed. Author

N75-31080* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROPULSION SYSTEMS TECHNOLOGY
Kirby W. Hiller, Peter G. Batterton, Paul L. Burstadt, and John R. Szuch *In its* Aeron. Propulsion 1975 p 387-440 refs (For availability see N75-31068 22-07)
CSCL 21E

The selection of components, control design, simulation, and tests are examined for designing supersonic propulsion systems. Inlet-engine combination under electronic control are shown. Design and test results from the integrated control for afterburning turbofan and supersonic cruise inlet are presented. Author

N75-31081* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUPERSONIC PROPULSION
John B. Whitlow, Jr. *In its* Aeron. Propulsion 1975 p 441-457 (For availability see N75-31068 22-07)
CSCL 21E

The Supersonic Cruise Airplane Research (SCAR) technology program is reported. Mission requirements, cycle considerations, engine evaluation, and SCAR test results are discussed. It is concluded that improved aerodynamics and structures, greater use of composites, and more-refined active controls are needed in the airframe area for designing an economically viable, environmental acceptable supersonic aircraft. F.O.S.

N75-31082* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HYPERSONIC PROPULSION
Griffin Y. Anderson *In its* Aeron. Propulsion 1975 p 459-474 refs (For availability see N75-31068 22-07)
CSCL 21E

The NASA research on scramjet technology for speeds above Mach 5 is reported. A brief overview of the NASA Hypersonic Research Engine (HRE) project is presented with emphasis on the most significant contributions on the HRE to scramjet technology. The work on high-performance airframe-integrated scramjet engines is described, and a new versatile research airplane is discussed with emphasis on propulsion. Author

N75-31083# Advisory Group for Aerospace Research and Development, Paris (France).
DIAGNOSTICS AND ENGINE CONDITION MONITORING
Allen E. Fuhs, ed., Richard Smyth, ed., H. Dissen, ed., Andrew Hess, ed., Dino Dini, ed., Richard Lazarick, ed., and W. R. Krupa, ed. Jun. 1975 342 p refs In ENGLISH; partly in FRENCH Conf. held at Liege, 4-5 Apr. 1974
(AGARD-CP-165) Avail: NTIS HC $9.50

Various engine monitoring techniques for aircraft turbine engines are summarized. These methods range from boroscope inspection, SOAP, and radiography to advanced concepts in flight data analysis, diagnostics, and prognostics. Data also cover economics, statistics, and function of engine condition monitoring. For individual titles, see N75-31084 through N75-31107.

N75-31084 Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
DIAGNOSTICS AND ENGINE CONDITION MONITORING
A. E. Fuhs *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 18 p refs (For availability see N75-31083 22-07)

Diagnostics and aircraft engine condition monitoring by computer are examined. Data cover computer costs, electronic reliability, prediction of impending engine malfunctions, engine control, and other instruments and data needed for computer operation. E.H.W.

N75-31085 Pisa Univ. (Italy).
PROBLEMS IN FAULT DIAGNOSTICS AND PROGNOSTICS FOR ENGINE CONDITION MONITORING
M. Andrenucci and R. Lazzeretti *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 10 p refs (For availability see N75-31083 22-07)

A general discussion of major problems concerning fault detection and isolation in ECM systems is presented. The ECM concept, history and development prospects are reviewed, and various questions regarding instrumentation, sensor requirements and some critical problem areas are considered. A detailed discussion is presented on the concept of an ECM system designed to provide an extensive in-flight diagnostic and prognostic capability. The main characteristics of such a system are analyzed, considering the various aspects of fault logic, parameter selection, diagnostic and prognostic procedures and system operation. Hardware requirements and display techniques are also discussed. Author

N75-31086 Societe Nationale d'Etudes et de Construction de Moteurs d'Aviation, Moissy-Cramayel (France). Centre D'essais de Villa Roche.
DIAGNOSIS OF THE FUNCTIONAL STATE OF A MOTOR BY MODELIZATION [DIAGNOSTIC DE L'ETAT DE FONCTIONNEMENT D'UN MOTEUR PAR MODELISATION]
A. Barbot *In* AGARD Diagnostics and Engine In FRENCH

(For availability see N75-31083 22-07)

A mathematical model was used to investigate engine damage and its effects on engine operation and performance. Two types of damage were considered: damage which effects performance and that damage which does not effect performance. In the case of performance effecting damage, thermodynamic parameters and the detection and localization of defects, were discussed. For non-performance effecting damage, degradation or rupture of rotating parts and metallurgic degradation of mechanical components were considered. Transl. by E.H.W.

N75-31087 Karlsruhe Univ. (West Germany).
THEORY OF PERIODIC TURBOMACHINE NOISE AND DETERMINATION OF BLADE DAMAGE FROM NOISE SPECTRUM MEASUREMENTS
Dieter Barschdorff *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 4 p refs (For availability see N75-31083 22-07)

The mechanical conditions of rotor blades as deduced from vibration or noise spectra measurements are examined. Noise sources and analytical models used to compute periodic noise in the time and frequency domain are discussed. It was noted that irregularities may be observed directly in the time domain using digital averaging techniques. As compared with the Fourier amplitude spectrum of a mechanically perfect rotor stage, additional discrete spectral lines to the blade passing frequency and its harmonics indicate mechanical damage. Moreover, the amplitude distribution of the additional frequency lines can serve as an indication for the specific nature of the irregularity.
Author

N75-31088 Army Aviation Systems Command, St. Louis, Mo.
AUTOMATIC INSPECTION, DIAGNOSTIC AND PROGNOSTIC SYSTEM (AIDAPS): AN AUTOMATIC MAINTENANCE TOOL FOR HELICOPTERS
Thomas C. Belrose *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 8 p refs (For availability see N75-31083 22-07)

An overall effort to develop an automatic inspection, diagnostic and prognostic system (AIDAPS) for US Army aircraft is summarized. Major performance requirements of the AIDAPS system include continuous monitoring of critical systems, automatic diagnosis of malfunctions, and prediction of service life remaining in certain components. The objective of this program is to develop, on existing aircraft and engines, AIDAPS systems for ultimate field application on future aircraft such as utility tactical transport aircraft system (UTTAS), heavy lift helicopter (HLH), and advanced attack helicopter (AAH). Author

N75-31089 Frankford Arsenal, Philadelphia, Pa. Fire Direction and Diagnostic Systems Div.
TECHNICAL DIAGNOSIS: A SYSTEMS APPROACH
R. J. Brachman *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 18 p (For availability see N75-31083 22-07)

The use of computer technology, in a test configuration, to direct tests, make measurements, analyze data, and produce specific output as to the specific nature of a fault in materials or operating systems, is examined. Technical diagnosis is defined and diagnostic systems design is discussed. Author

N75-31090 Grumman Aerospace Corp., Bethpage, N.Y.
ENGINE HEALTH AND FAULT DETECTION MONITORING: ITS FUNCTION AND IMPLEMENTATION PROCEDURE
William Brenner *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 7 p refs (For availability see N75-31083 22-07)

The realistic factors relative to an engine health and fault monitoring system and its functions and implementation are discussed as a basis for determining the performance condition and minimum maintenance duties of a high performance aircraft engine. An approach to raise the user's confidence level will be discussed. Opinions will be voiced with reference to whom should be involved in engine health and fault detection monitoring relative to concept formulation and design. Author

N75-31091 Riv-Officine di Villar Perosa S.p.A., Turin (Italy).
A CONTRIBUTION TO THE AERO ENGINES BEARINGS CONDITION MONITORING
S. Brignone, G. Fava, and F. Giordano *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 20 p refs (For availability see N75-31083 22-07)

From a survey of the existing techniques used to detect malfunctions in aircraft mainshaft bearings, it is concluded that they are mainly oriented toward the detection of the spalling fatigue initiation. It is pointed out that high speed, low loaded bearings fail mainly from surface distress caused by roller skidding or deficiencies of the lubrication system and the conclusion is drawn that a new monitoring device should be developed based on the measure of the bearing internal speeds. This device can detect bearing failures, running conditions that might cause an early failure, and could also be used for calculating the bearing accumulated life. Suggestions as to how to make the proposed measurements are given and some experimental data are presented. Author

N75-31092 Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France).
STUDY OF A PREVENTIVE MAINTENANCE SYSTEM AS CLASSIFIED BY DIAGNOSTIC AND PRONOSTIC BREAKDOWNS. APPLICATION TO MARBORNE 2F MOTORS [ETUDE D'UN SYSTEME DE MAINTENANCE PREVENTIVE PERSONNALISEE PAR DIAGNOSTIC ET PROGNOSTIC DE PANNES. APPLICATION AUX REACTEURS MARBORNE 2F.3]
Paul Caspi, Andre Rault, and Olivier Esmenjaud *In* AGARD Diagnostics and Engine Condition Jun. 1975 10 p refs In FRENCH (For availability see N75-31083 22-07)

Theoretical, statistical, and mathematical modeling techniques were combined in an attempt to develop a preventive maintenance system for engines. Data are based on the state or condition of major engine components. These components were assigned grades of perfect condition, small failure, and total failure. Engine breakdowns, on a statistical basis, were then used to determine which class a particular component was assigned. The Marborne 2F engine was used for the study. Transl. by E.H.W.

N75-31093 Technische Universitaet, Brunswick (West Germany). Inst. fuer Maschinenelemente und Foerdertechnik.
SOME EXPERIENCE IN ENGINE-TROUBLESHOOTING WITH INFLIGHT-DATA, RECORDED IN THE F-104G WITH THE LEADS-200
G. Dahl *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 24 p (For availability see N75-31083 22-07)

Inflight engine data, recorded during the flight test of the aircraft integrated data system (AIDS) LEADS-200 in the military fighter F-104G are processed to show their worth for accident investigation and early failure detection. These investigations are performed in close connection with an airforce test station.
Author

N75-31094 Rolls-Royce, Ltd., Bristol (England). Engine Div.
THE RELATIVE ROLE OF ENGINE MONITORING PROGRAMME DURING DEVELOPMENT AND SERVICE PHASES
A. E. Davies and H. L. Newman *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 16 p (For availability see N75-31083 22-07)

These data suggest that deep analysis of engine behaviour is extremely important in the flight development and commissioning stages. Examples of flight development data acquisition programs are given. These include trend analysis for Olympus 593 engines in Concorde development aircraft, flight strain gauging of blading, and an interesting approach to a diagnostic system using an airborne computer. Author

N75-31095 National Research Council of Canada, Ottawa (Ontario).
IN-FLIGHT THRUST MEASUREMENT: A FUNDAMENTAL ELEMENT IN ENGINE CONDITION MONITORING
M. S. Chappell and J. A. Gravelle (Computing Devices Co., Ottawa) *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 15 p refs (For availability see N75-31083 22-07)

The development of an in-flight gross thrust measuring system, as applied to an afterburning turbojet engine with a fully-modulating variable-area nozzle is described. The aerother-

modynamic approach is described as background to the experimental results from both ground level test bed and flight trial using a CF-5D aircraft as a test vehicle. Author

N75-31096 Ohio State Univ., Columbus.
VIBRATION DIAGNOSTICS IN HELICOPTER POWER TRAINS
D. R. Houser, M. J. Drosjack, and G. W. Hogg (Army Air Mobility R and D Lab., Ft. Eustis, Va.) *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 24 p refs (For availability see N75-31083 22-07)

The state-of-the-art of vibration diagnostics is reviewed for gears and bearings and the potential application of these techniques to helicopter usage. Related Army helicopter diagnostics research is also included. The usage of diagnostic techniques with gears and bearings in helicopter power trains is similar to that which may be encountered on gas turbine engines. A number of analysis procedures for diagnostic purposes were proposed, and some were tested. The mesh forces will produce nonsinusoidal vibrations which appear in the frequence domain as a proliferation of harmonics and side-bands of the gear meshing frequency. Author

N75-31097 Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
AN ADVANCED DIAGNOSTIC ENGINE MONITORING SYSTEM APPROACH
W. R. Krupa and K. R. Hamilton *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 11 p refs (For availability see N75-31083 22-07)

The Advanced Diagnostic Engine Monitoring System (ADEMS) is designed to monitor all of the significant engine parameters in-flight, and by the use of onboard digital computational techniques, compare the measured engine condition against normal expected design performance and also against test data related to component performance for a particular power setting. When engine performance degradation is detected, the computer automatically interrogates other engine parameters to indentify and isolate the engine component(s) that are outside normal operating limits. Out of tolerance readings are identified, and the crew is alerted to the parameter(s) and component(s) that are outside normal operating limits. Meanwhile, the computer automatically records engine parameters for post-flight analysis and long-term trending. Recording, in this sense, is by exception in order to minimize the amount of post-flight analysis. The expected payoff, when an ADEMS type system is engineered and applied to military aircraft, is a sizable reduction of overall maintenance and operational costs, improved utilization of in-service engines and spare parts, and an in-flight capability to automatically isolate and assess the impact of engine component degradation. Author

N75-31098 Rolls-Royce, Ltd., Derby (England). Engine Div.
ENGINE DATA RECORDING ON A PHANTOM AIRCRAFT: RESULTS OBTAINED TO DATE
P. A. Mucklow *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 7 p (For availability see N75-31083 22-07)

A recording system was installed in one Phantom aircraft expressly for recording Spey engine data. This provides for continuous recording in digital form of signals from 21 parameters at a rate of 1 or 2 samples/second. Significant results were obtained from this limited exercise. Author

N75-31099 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
EXPERIENCE WITH F-104G FDRS EVALUATION WITH RESPECT TO ENGINE DIAGNOSTICS
Bernd Mueller and Friedrich Bott *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 11 p (For availability see N75-31083 22-07)

A Flight Data Recording System (FDRS) is being introduced in a German F-104G fighter bomber wing in order to establish FDRS technology and cost effectiveness of an operational system. It is of particular interest to determine the possibilities and benefits of a most automatic debriefing after each flight in order to refine and verify present post flight check and pilot debriefing techniques. For this purpose the conventional verbal pilot debriefing for maintenance is backed up by an automatic FDRS diagnosis evaluated by a ground computer within about 10 minutes time after landing. Author

N75-31100 North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
TURBOJET ENGINE GAS PATH ANALYSIS: A REVIEW
Frederick O. Smetana *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 13 p (For availability see N75-31083 22-07)

Methods for determining the thermodynamic health of a turbojet engine and of its major components are surveyed in a critical fashion from the point of view of their theoretical potential. The quantitative effects of poor health on engine performance are detailed along with the inferences which can be drawn as to the reason for the poor health. Instrumentation requirements of the various techniques are discussed. The position of gas path analysis in an overall program of failure prediction is also treated. Author

N75-31101 Carleton Univ., Ottawa (Ontario).
AN ENGINE ANALYZER PROGRAM FOR HELICOPTER TURBOSHAFT POWERPLANTS
L. J. Staples (Leigh Instruments LTD., Ontario) and H. I. H. SaraVanaMuttoo *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 9 p refs (For availability see N75-31083 22-07)

A simple thermodynamic analysis technique was described; it was developed to sense the health of a helicopter power plant with a high degree of accuracy and sensitivity. The main design objective was to develop a method of analysis which requires minimum computational power and yet will produce those cycle parameters which are prime indicators of engine condition. The single-spool gas generator, free power turbine turboshaft was selected for consideration due to its almost universal application on present and forthcoming helicopter variants of interest. Author

N75-31102 Ministry of Defence, London (England).
A MILITARY OPERATOR'S VIEW OF AERO-ENGINE LOW CYCLE FATIGUE MONITORING
P. W. Swindlehurst *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 4 p (For availability see N75-31083 22-07)

Low cycle fatigue monitoring is set in the more general context of engine condition monitoring, and the basic mechanisms of low cyclic fatigue and its influence on critical component lifting are considered. A case is argued for a limited sampling program to assess the lifting problem in a particular operation. Methods of cyclic fatigue monitoring are discussed, and a case is made for the development of a low cycle fatigue counter. Author

N75-31103 Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
PARAMETER SELECTION FOR MULTIPLE FAULT DIAGNOSTICS OF GAS TURBINE ENGINES
Louis A. Urban *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 14 p refs (For availability see N75-31083 22-07)

Fundamentals of turbine engine multiple fault diagnosis are introduced, and its relationship to engine parameter selection and measurement requirements is presented. The influence of the type (thermodynamic cycle) of the engine to be diagnosed, and the nature of its expected problems, on the required parameters and the attendant measurement repeatability requirements are discussed. Author

N75-31104 KLM Royal Dutch Airlines, Amsterdam (Netherlands).
KSSU AIDS ENGINE ANALYSIS
H. Vermeulen *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 27 p (For availability see N75-31083 22-07)

Based on KLM's experience with a first generation digital AIDS the primary requirements for an AIDS for widebody aircraft included: (1) a high degree of accuracy and repeatability, (2) a high system MTBF, and (3) integration with the ARINC 573 digital flight data recorder systems. As the KSSU system concept

was developed to meet not only ECM but also flight operational, flight technical and other requirements, it is evident that a pure trade-off for ECM only becomes difficult. Author

N75-31105 National Aerospace Lab., Amsterdam (Netherlands).
ENGINE CONDITION PROBLEMS IN SUPERSONIC FLIGHT
J. P. K. Vleghert *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 6 p ref (For availability see N75-31083 22-07)

A performance discrepancy of Royal Netherlands Air Force fighters could be traced to a mass flow deficiency at low corrected RPM. Engine mass flow improved significantly when replacing the first stage compressor rotor blades. Probable cause of the deficiency was air foil deterioration when applying an anticorrosion treatment to the blades. Author

N75-31106 British Airways, Middlesex (England).
ENGINE HEALTH MONITORING IN A CIVIL AIRLINE
P. Waller and E. R. White *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 14 p refs (For availability see N75-31083 22-07)

The operational effects of prematurely failed engines are reviewed with estimated economic effects. The estimated return from an engine health monitoring system is considered in relationship to the cost of implementing and running it, and it is shown that a positive financial return is only likely if the basic data acquisition and analysis equipments are readily available for other purposes. The theoretical and experienced benefits are compared, and the limitations imposed by operating such a system in a competitive commercial environment are discussed, including the effects of stringent control over financial and personnel resources. The results achieved so far are critically examined in terms of the equipment design specifications and actual performance, and also the mathematical processes employed in reducing the data. Some of the deficiencies in these processes are discussed, with proposals for their improvement. The characteristics of the RB211 engines for BAED's next aircraft, the TriStar, as relevant to engine health monitoring, are examined in relationship to the recording system to be fitted, which includes a small but powerful computer with an input/output device for communicating with the flight crew. Author

N75-31107 Pacific Airmotive Corp., Burbank, Calif. Industrial and Marine Engine Div.
AN INTEGRATED RELIABILITY PROGRAM UTILIZED FOR AIRCRAFT INDUSTRIAL AND MARINE GAS TURBINES
R. E. Weiller *In* AGARD Diagnostics and Engine Condition Monitoring Jun. 1975 6 p refs (For availability see N75-31083 22-07)

Both the airline and industrial gas turbine operators have the requirement for a comprehensive maintenance and reliability program which has the flexibility of accepting changes in concept as new technology is developed. It was established and proven that on-condition and monitored maintenance type programs have not jeopardized or compromised safety or reliability. Author

N75-31108*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
JET ENGINE AIR INTAKE SYSTEM Patent Application
Norman E. Sorensen and Eldon A. Latham, inventors (to NASA) Filed 12 Sep. 1975 21 p
(NASA-Case-ARC-10761-1; US-Patent-Appl-SN-612899) Avail: NTIS HC $3.25 CSCL 21E

An axisymmetric air intake system for a jet aircraft engine comprising a fixed cowl extending outwardly from the face of the engine, a centerbody coaxially disposed within the cowl, and means for axially displacing the centerbody within the cowl is described. The cowl and centerbody define a main airflow passageway. In one embodiment, a system for opening and closing the centerbody air inlet is provided by a dual-member centerbody, the forward member of which is displaced axially with respect to the aft member. In a second embodiment, the centerbody air inlet may be opened and closed by means of doors located in the forward wall of a unitary-member centerbody. The air intake system may also be provided with closeable air inlets located in the cowl wall which communicate with cowl auxiliary airflow passageways to provide auxiliary airflow to the engine. Closeable bypass openings are provided which allow control of the normal shock wave within the main airflow passageway. NASA

N75-31109# Institut Franco-Allemand de Recherches, St. Louis (France).
CALCULATION OF BANG PROPAGATION IN REAL ATMOSPHERE: FOCALIZATION GEOMETRY FOR CONCORDE ASCENT LAW AND BANG INTENSITY NEAR THE LONGITUDINAL AND LATERAL EXTINCTIONS [CALCUL DELA PROPAGATION DU BANG EN ATMOSPHERE REELLE: POSITION GEOMETRIQUE DE LA FOCALISATION POUR LA LOI DE MONTEE DE CONCORDE INTENSITE DU BANG AU VOISINAGE DES EXTINCTIONS LONGITUDINALE ET LATERALES]
M. Schaffar and F. Schlosser 26 Apr. 1974 74 p refs In FRENCH
(Contract DRME-73/191)
(ISL-11/74) Avail: NTIS HC $4.25

The influence of meteorological conditions on the intensity and distributions of Concorde aircraft sonic boom was studied. Computation parameters and flight conditions were defined. Results show that the real atmosphere has definite effects on bang intensity and distribution as compared with standard atmosphere. Directional wind effects and temperature effects are detailed. ESRO

N75-31110# Dayton Univ. Research Inst., Ohio.
A REVISED COMPUTER PROGRAM FOR AXIAL COMPRESSOR DESIGN. VOLUME 1. THEORY, DESCRIPTIONS, AND USER'S INSTRUCTIONS Final Technical Report, 1 Oct. 1973 - 30 Nov. 1974
Richard M. Hearsey Jan. 1975 125 p refs
(Contract F33615-74-C-4030)
(AD-A009273/4; UDRI-TR-74-47-Vol-1; ARL-75-0001-Vol-1) Avail: NTIS CSCL 21/5

A description is given of a computer program that was developed for the design of axial compressors. The principal purpose of the program is to enable a single computer program to determine the geometry of the compressor blading, details of the flow within the compressor, and the design point performance of the machine. Some optional calculation routines will also enable effects of mixing of the flow to be investigated. The program consists fundamentally of three sections; two alternative means of determining blade geometry, and an aerodynamic computation for the flow through the compressor. GRA

N75-31111# School of Aerospace Medicine, Brooks AFB, Tex.
HYDROCARBON CONSTITUENTS OF T-56 COMBUSTOR EXHAUST Progress Report, Dec. 1973 - Dec. 1974
James P. Conkle, William W. Lackey, and Richard L. Miller Apr. 1975 17 p refs
(AD-A009133; SAM-TR-75-8) Avail: NTIS CSCL 21/5

Cryogenic sampling was used to sample hydrocarbon exhaust from a T-56 turbine engine combustor under conditions simulating idle power of several different aircraft. Parameters studied were fuel type--JP4, JP5, and JP8--and the combustor operating pressure--15, 33, 50, and 75 psig. Samples were analyzed with a gas chromatograph-mass spectrometer-data system which separated 148 compounds; the hydrocarbon content of the exhaust was inversely proportional to the inlet pressure and directly proportional to the boiling point and density of the fuel type. GRA

N75-31112# Transportation Systems Center, Cambridge, Mass.
NOISE EMISSIONS AND BUILDING STRUCTURAL VIBRATION LEVELS FROM THE SUPERSONIC CONCORDE AND SUBSONIC TURBOJET AIRCRAFT Final Report, Feb. - Jun. 1974
E. J. Rickley, R. W. Quinn, and N. R. Sussan Jun. 1974 260 p
(PB-241384/7; DOT-TSC-OST-74-35) Avail: NTIS HC $8.50 CSCL 01C

Noise emissions and building structural vibration levels were measured during landing and take off operations of the Anglo/French supersonic aircraft (Concorde) and from sone conventional subsonic turbojet aircraft. Measurements were made at both the Fairbanks International Airport, Fairbanks, Alaska and at the Logan International Airport, Boston, Massachusetts. This report contains

graphic level time history recordings, tabulated peak RMS noise and vibration levels measured, EPNL/PNLT history data, and 1/3 octave frequency spectra of selected events. GRA

N75-31113# Naval Postgraduate School, Monterey, Calif.
VELOCITY MEASUREMENTS IN A TRANSONIC COMPRESSOR USING A CALIBRATED PRESSURE PROBE M.S. Thesis
Dennis Jay Anderson Mar. 1975 105 p refs
(AD-A009801) Avail: NTIS CSCL 21/5

The application is reported of a United Sensor Corporation 5-hole pressure probe to determine the flow field upstream and downstream of the rotor of a transonic compressor operating to near sonic speeds. Calibration of the probe was reduced to a set of equations to allow off-line data reduction and presentation using a Hewlett-Packard Mcdel 9830A Calculator system. The flow velocities and angles measured upstream of the rotor were compared with results of compressible flow calculations. Blockage factors were determined which related analytical approximations of the flow incident at the rotor to the measured flow rate. The measurements downstream of the rotor were compared with those of a second probe of different design. GRA

N75-31114# AiResearch Mfg. Co., Phoenix, Ariz.
A FLUIDIC FUEL CONTROL FOR SMALL GAS TURBINE ENGINES. DEVELOPMENT OF AIRESEARCH FLUIDIC FUEL CONTROL 710374-4 FOR AIRESEARCH GAS TURBINE ENGINE MODEL GTPR36-61A Final Report, 11 Apr. 1974 - 15 Jan. 1975
R. S. McCarthy and H. R. Gamble 10 Mar. 1975 62 p
(Contract DAAK02-74-C-0175)
(AD-A009529; Rept-75-410911) Avail: NTIS

This is the final report of a program conducted by AiResearch and funded by the U.S. Army Mobility Equipment Research and Development Center to develop a fluidic fuel control for a small recuperated gas turbine engine. The basic functions provided by the control include engine starting, speed governing, and exhaust gas temperature limiting. Analysis, fabrication, and testing of the various fluidic circuits employed to generate the required control functions are described. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N75-31115*# Massachusetts Inst. of Tech., Cambridge. Measurement Systems Lab.
FLIGHT CONTROL SYSTEMS RESEARCH Annual Progress Report, 1 Sep. 1974 - 31 Aug. 1975
H. Philip Whitaker 31 Aug. 1975 15 p
(Grant NGL-22-009-548)
(NASA-CR-143620; RN-78) Avail: NTIS HC $3.25 CSCL 01A

Research on flight control systems is reviewed. Investigations were conducted to evaluate and test a recent method of calculation of the performance index, application to various example designs, and programming for the discrete data control system case. Author

N75-31116*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTOMATIC GUIDANCE AND CONTROL OF A TRANSPORT AIRCRAFT DURING A HELICAL LANDING APPROACH
Daniel J. Crawford Washington Sep. 1975 57 p refs
(NASA-TN-D-7980; L-10101) Avail: NTIS HC $4.25 CSCL 17G

A linear optimal regulator theory was applied to a nonlinear simulation of a transport aircraft performing a helical landing approach. A closed-form expression for the quasi-steady nominal flight path is presented along with the method for determining the corresponding constant nominal control inputs. The Jacobian matrices and the weighting matrices in the cost functional were time varying. A method of solving for the optimal feedback gains is reviewed. The control system was tested on several alternative landing approaches using both 3 deg and 6 deg flight path angles. On each landing approach, the aircraft was subjected to large random initial-state errors and to randomly directed crosswinds. The system was also tested for sensitivity to changes in the parameters of the aircraft and of the atmosphere. Results indicate that performance of the optimal controller on all the 3 deg approaches is very good. The control system proved to be reasonably insensitive to parametric uncertainties. Performance is not as good on the 6 deg approaches. A modification to the 6 deg flight path was proposed for the purpose of improving performance. Author

N75-31117# Naval Postgraduate School, Monterey, Calif.
FLIGHT DIRECTOR LAWS FOR THE LONGITUDINAL CYCLIC AND COLLECTIVE CONTROLS OF THE UH-1H HELICOPTER M.S. Thesis
Gordon Kenneth Smith Mar. 1975 41 p refs
(AD-A009822) Avail: NTIS CSCL 01/4

A technique for determining flight director laws for the longitudinal control of a V/STOL aircraft in landing approach is evaluated. The method is based on the application of an optimal control model for the human pilot. The vehicle studied was the UH-1H helicopter at three approach groundspeeds: 60 knots, 40 knots, and 20 knots. The two pilot outputs were longitudinal cyclic and collective. In the analysis, ten pilot transfer functions which relate the two control variables to the five displayed and perceived quantities were obtained. These transfer functions were then used to obtain the respective flight director laws. GRA

N75-31118# Naval Air Development Center, Warminster, Pa. Vehicle Technology Dept.
USER'S GUIDE FOR SIX-DEGREE-OF-FREEDOM DIGITAL COMPUTER AIR VEHICLE SIMULATION
James C. Duke 16 Apr. 1975 157 p refs
(AD-A009474; NADC-74258-30) Avail: NTIS CSCL 01/3

This report is a user's manual for a NAVAIRDEVCEN (Naval Air Development Center) developed 6DOF (six-degree-of-freedom), air vehicle stability, performance, and control digital computer simulation. Included are descriptions of the coordinate systems, the aerodynamic, thrusting, and inertial forces and moments acting upon the vehicle, the equations of motion, and the atmosphere model. Discussions of such user oriented information as the selection and specification of run parameters, data implementation procedures, as well as a sample program listing with related flow charts are included. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N75-31119*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE REVOLUTION IN DATA GATHERING SYSTEMS
Joseph M. Cambra and William F. Trover (Teledyne Controls) Aug. 1975 26 p refs
(NASA-TM-X-62452; A-6144) Avail: NTIS HC $3.75 CSCL 14B

Data acquisition systems used in NASA's wind tunnels from the 1950's through the present time are summarized as a baseline for assessing the impact of minicomputers and microcomputers on data acquisition and data processing. Emphasis is placed on the cyclic evolution in computer technology which transformed the central computer system, and finally the distributed computer system. Other developments discussed include: medium scale integration, large scale integration, combining the functions of

data acquisition and control, and micro and minicomputers.
Author

N75-31120# Utah State Univ., Logan. Dept. of Mechanical and Manufacturing Engineering.
A KINETIC MODEL OF LANDING MAT PERFORMANCE
P. T. Blotter, F. W. Kiefer, and K. Daftarian 21 Apr. 1975 37 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Aircraft in Nov. 1975 Sponsored by Air Force
Avail: NTIS HC $3.75

An analytical model which simulates the dynamic response of expedient airfield surfaces subjected to various aircraft landings is developed. The prototype system of interconnected modules, commonly referred to as landing mat, is represented by a system of discrete masses suspended and interconnected by springs and dashpots which simulate the soil-mat and mat-mat interactions. The three degree of freedom model considers mat rotation and translation in the longitudinal and vertical directions. The model development is sufficiently general to predict the effect of mat geometry, different laying patterns, friction, joint modifications, aircraft weight, aircraft deceleration and other such modifications on the mat performance. As a typical application, the model is used to simulate the bow wave performance experienced in AM2 mat subjected to C-5A aircraft landings. Analytical model results are also compared with a 1/7 scale physical model of the AM2 landing field and C-5A landing gear.
Author

N75-31121# European Space Research Organization, Paris (France).
FACILITIES AT THE EUROPEAN SPACE TRIBOLOGY LABORATORY. A USER'S HANDBOOK
Mar. 1975 13 p
(ESRO-SP-104) Avail: NTIS HC $3.25

Available test facilities, including vacuum test chambers and thermal cycling equipment, are described and some factors to be borne in mind when defining a test program are given.
ESRO

N75-31122# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
CALIBRATION OF X-RAY ION CHAMBERS FOR THE SPACE ENVIRONMENT MONITORING SYSTEM
Arlyn Unzicker and Richard F. Donnelly Nov. 1974 56 p refs
(COM-75-10667/4; NOAA-TR-ERL-310; SEL-31; NOAA-75021108) Avail: NTIS MF $2.25; SOD HC as C55.13:ERL-310-SEL-31 CSCL 18D

Measurements of the steady-state of the ion-chamber current output to the incident energy flux of a monochromatic X-ray beam are reported for ion chambers for the NOAA Space environment Monitoring System. Bragg crystal reflection was employed to obtain a monochromatic beam. Proportional counters were used to measure the absolute intensity of the monochromatic X-ray beam. An ultra-sensitive electrometer was used to measure the current output of the ion chamber. Calibration results are compared with the theoretical transfer function. The effects of anode structures on reducing the effective total area of the ion chambers were observed as a function of wavelength.
GRA

N75-31123# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
REDUCTION OF TRANSONIC SLOTTED WALL INTERFERENCE BY MEANS OF SLAT CONTOURING Final Report, Jul. 1971 - Jul. 1974
T. M. Weeks Mar. 1975 60 p refs
(AD-A009591; AFFDL-TR-74-139) Avail: NTIS CSCL 14/2

A set of experiments was accomplished to first establish the extent of wall interference in the AFFDL 15-Inch Transonic Slotted Wall Tunnel and subsequently to provide criteria for alteration to the slat geometry to verify interference-free conditions. The wall design concept is based on external free-flight mutual compatibility conditions imposed on pairs of independent mid-field flow quantities and is dependent upon highly accurate local measurement of any independent set of such flow properties, e.g., flow angle and static pressure. Biconvex airfoils of 2.5 and 5-inch chord were used as models in this two-dimensional embodiment of the mid-field flow concept. The nonlifting case was verified and baseline data for planned wall interference reduction tests with lift were obtained.
GRA

N75-31124# University of Southern Calif., Los Angeles. Behavioral Technology Labs.
PRELIMINARY SPECIFICATIONS FOR AN AWG-9 WCS MAINTENANCE TRAINER FOR THE F-14 AIRCRAFT Final Report, 1 Jan. - 31 Dec. 1974
Joseph W. Rigney, Douglas M. Towne, and D. Kirk Morrison Apr. 1975 52 p refs
(Contract N61339-74-C-0065; ARPA Order 2310) (AD-A009365; NAVTRAEQUIPC-74-C-0065-1) Avail: NTIS CSCL 05/9

This report contains preliminary specifications for an AWG-9 WCS maintenance trainer. These were derived using a procedure described in an earlier report in this series. The specifications for a particular application of performance-structure-oriented CAI, such as this, follow from mapping specific features of task structures, contextual structures, and the instructional strategy to be used into the frameworks of general subsystems in CAI systems and of the major interactive loops in these systems. The resulting implications for hardware and software specifications then are developed by successive approximations until they are sufficiently specific to guide hardware acquisition and computer programming.
GRA

N75-31125# New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
PARAMETRIC STUDIES OF LAYERED PAVEMENT SYSTEMS USING AFPAV CODE WITH FAST EQUATION SOLVER Final Report, 15 Nov. 1973 - 30 Jun. 1974
Raman Pichumani, Edward P. Dunphey, and Harold J. Iuzzolino Apr. 1975 54 p refs
(Contract F29601-74-C-0030; AF Proj. 2104)
(AD-A009479; AFWL-TR-74-237) Avail: NTIS CSCL 01/5

The effort was concerned with the improvement of the nonlinear version of the AFPAV computer code to reduce the central processing (CP) time of the CDC 6600 computer in solving layered pavement problems. Parametric studies were also performed to determine the significance of several input parameters and their effects on significant output data. These parametric studies were based on factorial designs formulated according to the statistical analysis techniques employed in analyzing experimental results. The experiments in this case were computer analyses of layered pavement structures, which are idealized as prismatic solids, loaded by multiwheeled aircraft. The studies covered (1) the effects of the number of node points and the bandwidth on computer running time, and (2) the effects of layer properties (including the nonlinear constitutive relationships of base and subgrade materials), load intensity, finite-element mesh size, etc., on the maximum surface deflection and the maximum tensile strain in the surface layer.
GRA

N75-31126# New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
FINITE-ELEMENT ANALYSIS OF PAVEMENT STRUCTURES USING AFPAV CODE (NONLINEAR ELASTIC ANALYSIS) Final Report, Aug. 1972 - Nov. 1973
John Crawford and Raman Pichumani Apr. 1975 88 p refs
(Contract F29601-72-C-0024)
(AD-A009478; AFWL-TR-74-71) Avail: NTIS CSCL 01/5

An evaluation and derivation of the nonlinear version of the Airfield Pavement (AFPAV) code which is based on the finite-element structural analysis technique is presented. This code provides an analytical capability for modeling all types of pavement systems and could be used in conjunction with the rational pavement evaluation procedure being developed by the Air Force Weapons Laboratory (AFWL). Professor Hardin's nonlinear stress/strain relationships for base and subgrade materials are used in this code to simulate nonlinear behavior by a series of piecewise linear analyses of the pavement structure. The improved analytical predictions effected by using the nonlinear version of the code are demonstrated by comparing the results with the data from full-scale pavement test sections.
GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N75-31127*# Essex Corp., Alexandria, Va.
ROLE OF MAN IN FLIGHT EXPERIMENT PAYLOADS, PHASE 2 Final Report
Mark Kirkpatrick, P. Norman Frederick, and Thomas B. Malone Jul. 1975 159 p refs
(Contract NAS8-30953)
(NASA-CR-143939) Avail: NTIS HC $6.25 CSCL 22A

A methodology for performing trade-off analyses in the areas of crew skill mix and crew time allocations for Spacelab experiments is presented. Experiment function allocations are evaluated in terms of impact on experiment completion based on the functional requirements of the experiment. A computer program is used to simulate experiment operation. Guidelines for input of data to the program, descriptions of the specific input for the Concept Verification Testing project run, and discussion of the results are included. Methods for utilizing the output data for trade-offs in the areas of crew skills, crew time, workload, and training requirements are discussed along with conclusions and recommendations. Author

N75-31128*# Essex Corp., Alexandria, Va.
ROLE OF MAN IN FLIGHT EXPERIMENT PAYLOADS, PHASE 2, APPENDIX A Final Report
Mark Kirkpatrick, P. Norman Frederick, and Thomas B. Malone Jul. 1975 67 p
(Contract NAS8-30953)
(NASA-CR-143940) Avail: NTIS HC $4.25 CSCL 22A

The functional requirements questionnaire used to obtain data from shuttle payload planners regarding the sequence of functions which comprise experiments within their cognizance is presented. These data are gathered to support analysis of crew performance and skill requirements and to provide a method for determining the role of man in various Spacelab experiments. Author

N75-31129# European Space Research Organization, Paris (France).
EUROPEAN CAPABILITIES FOR SPACE APPLICATIONS. VOLUME 1: PRESENTED PAPERS. VOLUME 2: CONTRIBUTED PAPERS ON SELECTED TOPICS OF COMMUNICATION SATELLITE SYSTEMS
1975 800 p refs Partly in FRENCH; partly in ENGLISH Proc. of the European Space Days, Noordwijk, Neth., 27-29 May 1975
Avail: NTIS HC $17.25

European space programs are reviewed with particular emphasis on the technological capabilities of the European aerospace industry. The contributions can be classified into the following fields: status of space technology in Europe; communication satellite programs in Europe; satellite ground segments; applications satellites missions; and launch vehicle development in Europe. Selected topics of communication satellite systems include application satellite systems; European apogee boost motors; advanced satellite attitude control; satellite structure and thermal control; satellite power supply and control; satellite communications and payload technology; and satellite ground station technology. For individual titles, see N75-31130 through N75-31175.

N75-31130 European Space Research Organization, Paris (France).
REVIEW OF EUROPEAN SPACE PROGRAMS
R. Gibson *In its* European Capabilities for Space Appl. 1975 7 p (For availability see N75-31129 22-12)

Ten years of European space activities, which have led to the launching of just short of 40 European satellites, are reviewed. French, UK, and German projects are mentioned and the ESRO projects, divided into scientific satellite and application satellite programs, are detailed. The Ariane launcher project is dealt with, along with Spacelab program. ESRO

N75-31131 Eurospace, Paris (France).
THE EUROPEAN SPACE INDUSTRY IS READY TO DELIVER OPERATIONAL SYSTEMS [L'INDUSTRIE SPATIALE EUROPEENNE EST PRETE A FOURNIR DES SYSTEMES OPERATIONNELS]
Yves Demerliac *In* ESRO European Capabilities for Space Appl. 1975 11 p In FRENCH (For availability see N75-31129 22-12)

The role of EUROSPACE, the Association of Aerospace Industries in Western Europe, in European space industry is discussed: (1) mediation between the European Space Agency and industry and (2) studying the economic viability of space projects. The credibility of the European space industry is illustrated by mentioning a range of satellites, launchers, or ground stations which are completely European or in which European industry participated, such as Diamant, Black Arrow, San Marco, Kourou, APT, Skynet, Symphonie, and Spacelab. Advantages associated with the delivery of European space systems are discussed, including delivery of material, operational and management of systems, client assistance in planning, and financial facilities. ESRO

N75-31132 European Space Research Organization, Paris (France).
THE SPACELAB PROGRAM: A DEMONSTRATION OF EUROPEAN SPACE CAPABILITIES
Bernard Deloffre *In its* European Capabilities for Space Appl. 1975 21 p (For availability see N75-31129 22-12)

Program objectives and requirements as well as the financial constraints of the Spacelab program are described. The management scheme between ESRO and NASA is discussed based on mutual responsibilities as agreed in the Memorandum of Understanding. A Spacelab elements and industrial work to date is described. It is expected that Spacelab will become the forerunner of other international enterprises. Author (ESRO)

N75-31133 Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).
THE SPACELAB PROJECT: AN APPLICATION OF EXPERIENCE AND KNOW-HOW OF EUROPEAN INDUSTRY IN TECHNOLOGY AND MANAGEMENT
Hans E. W. Hoffmann *In* ESRO European Capabilities for Space Appl. 1975 18 p (For availability see N75-31129 22-12)

It is shown that the development of Spacelab, a joint U.S.-European venture, can be considered as a normal extension of the work which was done in the space field in Europe. The technological requirements for Spacelab are indicated, and the technological know-how that the prime contractor and the various subcontractors have gained, is presented. Management aspects of the Spacelab project are discussed. ESRO

N75-31134 European Space Research Organization, Paris (France).
GENERAL OUTLINE OF EUROPEAN ACTIVITIES IN THE FIELD OF COMMUNICATION SATELLITES [APERCU GENERAL DES ACTIVITES EUROPEENNES DANS LE DOMAINE DES SATELLITES DE TELECOMMUNICATIONS]
W. Luksch *In its* European Capabilities for Space Appl. 1975 15 p In FRENCH (For availability see N75-31129 22-12)

The history of the work in Europe on telecommunication by satellite during the last ten years is given. A number of national and international projects are dealt with, such as PAS, Symphonie, Sirio, participation of European industry in Intelsat 3 and 4, application programs of ESRO, Skynet, and MAROTS. The role the successor of ESRO and ELDO, the European Space Agency, will play in the field of communication satellites is discussed. ESRO

N75-31135 Consiglio Nazionale delle Ricerche, Rome (Italy).
THE SIRIO PROGRAMME
F. Carassa and M. Macchia *In* ESRO European Capabilities for Space Appl. 1975 11 p refs (For availability see N75-31129 22-12)

The features and the objectives of the Italian Sirio satellite program and the characteristics of its major systems are summarized. The principal objective is to investigate the applicability of frequencies above 10 GHz to satellite communication systems, through an SHF propagation and communication experiment. Author (ESRO)

N75-31136 Consortium Franco Allemand pour le Satellite Symphonie (CIFAS), Les Mureaux (France).
THE SYMPHONIE PROJECT
P. J. Madon, B. R. K. Pfeiffer (CNES), and E. J. Pomp (MBB) *In* ESRO European Capabilities for Space Appl. 1975 33 p (For availability see N75-31129 22-12)

The development of Symphonie, a French-German telecommunication satellite system in the 4 to 6 GHz frequency range, is described. The first flight model, successfully launched on 19 December 1974, became operational on 11 January 1975 after completion of the transfer and positioning phase. The experimental utilization, including determination of the system performance characteristics, TV, telephone, broadcasting transmission, and time division multiple access experiments, is well under way. The three axis stabilized satellite system can be applied to regional systems. ESRO

N75-31137 European Space Research Organization, Paris (France).
THE EUROPEAN COMMUNICATION SATELLITE PROGRAMME AND THE ORBITAL TEST SATELLITE
R. C. Collette *In its* European Capabilities for Space Appl. 1975 58 p (For availability see N75-31129 22-12)

OTS is a stabilized platform with sun oriented solar arrays and consists of two separate modules: (1) a service module grouping most support subsystems and (2) a communication module including repeaters and antennas. Adaptability of the basic platform to the requirements of various communication missions was emphasized. The first flight, scheduled for mid 1977 using a Delta 3914 launcher, will carry a 11/14 GHz payload as an experimental system for public communications and television exchange within Europe. At a later stage, the operational system envisaged for European regional communications will be based on a derivative of OTS. At the end of 1977, a second flight of the OTS platform is foreseen, in this instance to support the operation of an L-band payload within the framework of ESRO's maritime program. Author (ESRO)

N75-31138 European Space Research and Technology Center, Noordwijk (Netherlands).
MAROTS: A EUROPEAN SATELLITE FOR MARITIME COMMUNICATIONS
J. A. Vandenkerckhove *In* ESRO European Capabilities for Space Appl. 1975 27 p (For availability see N75-31129 22-12)

Objectives of the MAROTS program, selected frequencies, geographical coverage, and maritime communication capability are described. Essential characteristics of the ship terminals and their influence on system capacity and cost effectiveness, as well as the spacecraft design, which is modular and based on the OTS satellite, are dealt with. Tasks of the ground facilities, the selected industrial organization and the program planning are summarized. Author (ESRO)

N75-31139 Hawker Siddeley Dynamics Ltd., Stevenage (England).
THE INDUSTRIAL DEVELOPMENT OF OTS AND MAROTS
P. L. V. Hickman and J. E. Humby *In* ESRO European Capabilities for Space Appl. 1975 54 p refs (For availability see N75-31129 22-12)

The way in which the MESH consortium is organized to discharge its responsibilities to ESRO for the Orbital Test Satellite (OTS) and MAROTS projects is described. OTS will handle all types of communication traffic within Europe while MAROTS is derived from OTS and will provide reliable ship-to-shore communications over one third of the globe. It is shown that the basic OTS spacecraft can be used to satisfy the communication requirement of other regions throughout the world.
Author (ESRO)

N75-31140 AEG-Telefunken, Backnang (West Germany).
THE OTS COMMUNICATION PAYLOAD: HIGH TECHNOLOGY EQUIPMENT DEVELOPMENT TO SYSTEM FLIGHT READINESS
Hans-Klaus Ball and Walter Stoesser *In* ESRO European Capabilities for Space Appl. 1975 17 p (For availability see N75-31129 22-12)

Design and development of the OTS repeater, within the modular repeater program, are aimed at providing high technology, qualified building blocks for a 14/11 GHz repeater subsystem to satisfy the future needs of the European communication satellite. The configuration and the main performance parameters of the OTS repeater are presented. Features are emphasized, such as the incorporation of a parametric amplifier as a low noise front end, use of microwave integrated circuits in the IF section, and the output traveling wave tube amplifier. Program status is reviewed to demonstrate the flight readiness of the OTS repeater. Author (ESRO)

N75-31141 Selenia S.p.A., Rome (Italy). Space and Telecommunication Div.
THE OTS/ECS ANTENNAS: A HIGH TECHNOLOGY ANTENNA SYSTEM DEVELOPMENT c17
Andrea Marri *In* ESRO European Capabilities for Space Appl. 1975 17 p (For availability see N75-31129 22-12)

The OTS antenna subsystem is discussed for in-orbit communication experiments based on frequency reuse techniques by means of polarization discrimination. After an introduction to the industrial capabilities of Selenia in the field of satellite antennas, the implementation of the antenna subsystem for OTS is described. Design trade-offs of the subsystem include electrical, mechanical, and thermal design. ESRO

N75-31142 Marconi Space and Defence Systems Ltd., Portsmouth (England).
THE MAROTS COMMUNICATION PAYLOAD c17
Derek Mclauchlan *In* ESRO European Capabilities for Space Appl. 1975 13 p (For availability see N75-31129 22-12)

The communication payload of MAROTS, including transponder, antennas, telemetry, tracking, and command is described briefly. The subsystem payload and engineering realization are discussed, and the industrial grouping of the MAROTS communication payload is detailed. ESRO

N75-31143 European Space Operations Center, Darmstadt (West Germany).
GEOSTATIONARY SATELLITES AND GROUND SUPPORT FACILITIES c14
G. Formica *In* ESRO European Capabilities for Space Appl. 1975 30 p (For availability see N75-31129 22-12)

Operations required to put a satellite into a geostationary orbit, involving launch, transfer orbit, apogee motor firing, drift orbit, station keeping, and orbit attitude software systems are discussed. Ground facilities required for spacecraft support are dealt with, and ESRO facilities are described. ESRO's geostationary satellites are briefly discussed: GEOS, Meteosat, OTS, MAROTS, Aerosat, and IUE (cooperation with NASA and the United Kingdom). ESRO

N75-31144 Conference Europeenne des Administrations des Postes et des Telecommunications (CEPT), Rome (Italy).
TELECOMMUNICATION GROUND STATIONS IN THE EUROPEAN TELECOMMUNICATION SATELLITE PROGRAM [LES STATIONS TERRIENNES DE TELECOMMUNICATIONS DU PROGRAMME EUROPEEN DE TELECOMMUNICATIONS PAR SATELLITE] c14
J. P. Houssin *In* ESRO European Capabilities for Space Appl. 1975 7 p In FRENCH (For availability see N75-31129 22-12)

The European Telecommunication Administrations, coordinating their activities through CEPT (European Post and Telecommunication Administrations Conference), are responsible for setting up the ground stations for the future European satellite communication network. The use of the 11 and 14 GHz frequency bands will permit the sites of these ground stations to be near main traffic switching centers in big towns. Multiple access time division numerical modulation techniques and numerical concentration of telephone conversations will allow very efficient satellite utilization. For the period after 1980, some 20 ground stations will be constructed. In four countries, such stations will be used for testing the experimental and preoperational OTS from mid-1977 onwards. ESRO

N75-31145 AEG-Telefunken, Backnang (West Germany).
OTS SCTS: THE GROUND STATION FOR IN-ORBIT OPERATION OF THE OTS c14
Peter Bodenstein and Martin Boerner *In* ESRO European Capabilities for Space Appl. 1975 11 p (For availability see N75-31129 22-12)

The OTS Satellite Control and Test Station, the world's first operational earth terminal to use 11/14 GHz frequencies, is described. The operational functions are dealt with; the basic concept and performance parameters are given; and the industrial background is detailed. Located at Fucino/Italy, the station will be linked to ESA's Operation Control Center at Darmstad/Germany. Handover of the station for in-station test prior to satellite launch is scheduled for mid 1977. ESRO

N75-31146 Telspace, Paris (France).
TECHNOLOGY OF GROUND STATIONS OF THE EUROPEAN SATELLITE COMMUNICATION SYSTEM [TECHNOLOGIE DES STATIONS TERRIENNES DES SYSTEMES EUROPEENS DE TELECOMMUNICATIONS PAR SATELLITE] c14
A. Blanchi and J. Salomon *In* ESRO European Capabilities for Space Appl. 1975 35 p In FRENCH (For availability see N75-31129 22-12)

First Symphonie ground stations are dealt with; the main stations include the Pleumeur-Boudou station, the station of the La Reunion-type, and the economic station of the Andromede-type. Secondary stations are a television reception station and a transportable station. Next, the experimental station at Gometz, operating between 10 and 35 GHz is discussed. Finally, the French station to be built at Bercenay-en-Othe for the OTS/ECS programs is detailed, including the studies leading to the development of the various subsystems. ESRO

N75-31147 European Space Research Organization, Paris (France).
PRESENT AND FUTURE EUROPEAN SPACE APPLICATIONS MISSIONS
A. Dattner, M. Fournet, and J. Collet *In its* European Capabilities for Space Appl. 1975 35 p Partly in ENGLISH; partly in FRENCH (For availability see N75-31129 22-12)

European application satellites, other than communication satellites, are discussed: meteorology, earth resources, and geodesy point determination. Future trends of satellite communications in Europe are dealt with, such as data transmission, computer communication, remote printing, teleconferencing, offshore oil exploration, and sound and television broadcasting. ESRO

N75-31148 European Space Research Organization, Paris (France). Spacelab Utilization Div.
UTILIZATION OF SPACELAB
Jacques Collet *In its* European Capabilities for Space Appl. 1975 17 p (For availability see N75-31129 22-12)

After a short review of the advantages and disadvantages of Spacelab over unmanned satellites, examples of the scientific applications offered by Spacelab are given. The following subject fields are dealt with: atmosphere and plasma physics, meteorite physics, astronomy, astrophysics, life sciences, and material science, and space processing. The latter include space electrophoresis, crystal growth, fluid physics, metallurgy, glasses, and ceramics. ESRO

N75-31149 European Space Research Organization, Paris (France).
THE ARIANE PROGRAM: HISTORICAL AND POLITICAL ASPECTS, MOTIVATION, PROGRAM, OBJECTIVES, OVERALL ORGANIZATION AND PERSPECTIVES [LE PROGRAMME ARIANE - ASPECTS HISTORIQUES ET POLITIQUES, MOTIVATION, OBJECTIFS DU PROGRAMME, ORGANISATION D'ENSEMBLE ET PERSPECTIVES]
R. M. Orye *In its* European Capabilities for Space Appl. 1975 5 p In FRENCH (For availability see N75-31129 22-12)

The historical events leading, in 1973, to the decision to develop the heavy launcher Ariane are presented. The Ariane program and management are detailed. Ariane should be operational beginning of 1981, after 4 trial flights from the Kourou base. ESRO

N75-31150 Centre National d'Etudes Spatiales, Bretigny-sur-Orge (France).
THE ARIANE PROGRAM: A EUROPEAN LAUNCH VEHICLE DEVELOPMENT EFFORT
Federic Allest *In* ESRO European Capabilities for Space Appl. 1975 7 p (For availability see N75-31129 22-12)

The Ariane launch vehicle is simple and conservative. The management, industrial organization, contract situation, and development status are presented. ESRO

N75-31151 Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
THE ARIANE LAUNCHER: BASIC DESIGN AND DEVELOPMENT STATUS
Henri Lacaze *In* ESRO European Capabilities for Space Appl. 1975 23 p (For availability see N75-31129 22-12)

Design and development of Ariane, a three stage launch vehicle for geostationary orbits are presented. The main components are described. The trajectory and launch capability are discussed. ESRO

N75-31152 European Space Research and Technology Center, Toulouse (France). Meteosat Project Office.
SUMMARY DESCRIPTION OF THE EUROPEAN METEOROLOGICAL SATELLITE (METEOSAT) PROGRAMME
In ESRO European Capabilities for Space Appl. 1975 5 p (For availability see N75-31129 22-12)

The European Meteosat program is described, including program and system objectives, missions, space and ground segment, and system performances. Establishment of the Meteosat system in 1977 and launching of the first European meteorological satellite into a geostationary orbit in mid-1977 are foreseen. ESRO

N75-31153 Marconi Space and Defence Systems Ltd., Portsmouth (England).
SKYNET: THE UNITED KINGDOM COMMUNICATIONS SATELLITE SYSTEM
W. M. Lovell *In* ESRO European Capabilities for Space Appl. 1975 13 p (For availability see N75-31129 22-12)

System deployment, spacecraft description, ground segment, and in-orbit performance of Skynet, the U.K. satellite communication system, are given. The Skynet system was operational in 1969. The second series of satellites has been designed and built and became operational in January, 1975. The complete system includes fixed earth stations, which they can be interconnected with the telephone network, as well as air transportable and mobile terminals. The system provides satellite communications by microwave direct to ships of modest size using a specially developed terminal. Author (ESRO)

N75-31154 Laboratoire Central de Recherches Thomson-CSF, Orsay (France). Space Dept.
POSSIBLE EVOLUTION OF COMMUNICATION SATELLITE PAYLOADS [EVOLUTION POSSIBLE DES CHARGES UTILES DE SATELLITES DE TELECOMMUNICATIONS] c17
C. Skenderoff *In* ESRO European Capabilities for Space Appl. 1975 20 p In FRENCH (For availability see N75-31129 22-12)

Possible technological developments and the application of 1980 technology in a communication satellite to be launched in 1985 were studied. Communication payload and commutation matrix are discussed for a basic satellite configuration and an evolved satellite configuration antenna performance. ESRO

N75-31155 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
DEVELOPMENT OF THE SYMPHONIE APOGEE BOOST MOTOR c20
Manfred A. Schwende *In* ESRO European Capabilities for Space Appl. 1975 10 p (For availability see N75-31129 22-12)

The motor was used successfully for the injection of Symphonie from the elliptical transfer orbit into a nearly synchronous orbit. The apogee motor is a completely separate module in the satellite with a dry mass of 17.9 kg and a filled system mass of 176.5 kg. The required velocity increment was 1472 + or - 18 m/sec (reached: 1472.8 m/sec) for a total spacecraft mass of 402 kg. The system works with a bipropellant engine of 400 N thrust. MON 0.3 as oxidizer and AZ 50 as fuel are stored in a nearly spherical tank separating the liquids by an intermediate membrane. Helium as pressurization gas, is stored in high pressure vessels at 400 bar, as the propellants with 16.5 bar after reduction by a one-step pressure reducer. Author (ESRO)

N75-31156 Societe Europeenne de Propulsion, Bordeaux (France).
SOLID APOGEE BOOST MOTOR DEVELOPMENT c20
Wazir Asad *In* ESRO European Capabilities for Space Appl. 1975 11 p (For availability see N75-31129 22-12)

The present technological standard of a typical apogee motor is described. Possible improvements of motor case materials, nozzle, thermal insulation, igniter, and propellants, with their relative impact and importance, are dealt with. (ESRO)

N75-31157 British Aircraft Corp., Stevenage (England).
GIMBALLED MOMENTUM WHEEL SYSTEM: ATTITUDE CONTROL CONCEPT FOR COMMUNICATIONS SATELLITES c18
J. A. Holt *In* ESRO European Capabilities for Space Appl. 1975 15 p (For availability see N75-31129 22-12)

The momentum wheels are compatible with current European technology and with the requirements for highly reliable, long life operation. Normal double gimballed system operation including orbit maneuvers and wheel/gimbal desaturation is described, together with a single gimballed operation if a failure affects either gimbal. The flexibility of the gimballed wheel concept and its insensitivity to variation in the requirements results in hard-ware that is suitable for a wide range of missions. The BAC approach to design confirmation using computer simulation and 3-axis air bearing rig testing is presented. Author (ESRO)

N75-31158 Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
GIMBALLED MOMENTUM WHEELS: RELIABLE ACTUATORS FOR SATELLITE ATTITUDE CONTROL c18
W. D. Limpert *In* ESRO European Capabilities for Space Appl. 1975 15 p (For availability see N75-31129 22-12)

Two versions of double gimballed momentum wheels are developed. Such systems provide operational advantages and improve attitude control accuracy as was shown with the Symphonie satellite, launched in December 1974. The performance characteristics of various gimbal systems are discussed. ESRO

N75-31159 Officine Galileo S.p.A., Florence (Italy).
INFRARED HORIZON SENSORS FOR APPLICATION SATELLITES c18
In ESRO European Capabilities for Space Appl. 1975 22 p (For availability see N75-31129 22-12)

The HCI, ESS, and IRES sensors are discussed. The horizon crossing indicator (HCI) used onboard ESRO 4, a static pencil beam IR sensor working in the 14 to 16.25 micron bandwidth, is able to detect the earth horizon from spinning satellites. The ESS for OTS consists of an earth elevation sensor (dual beam IR) and a sun elevation sensor (x-beam sun sensor working in the visible region) assembled in the same mechanical frame. The two-axis infrared sensor IRES, also for OTS, is suitable for geostationary three-axis stabilized communication satellites attitude control. The sensor, of a scan-through type, is based on the mechanical modulation of the energy from the earth horizon. ESRO

N75-31160 Societe Anonyme d'Etudes et Realisations Nucleaires, Limeil-Breuannes (France).
INFRARED HORIZON SENSORS FOR APPLICATION SATELLITES c18
F. Desvignes *In* ESRO European Capabilities for Space Appl. 1975 12 p (For availability see N75-31129 22-12)

Sodern is described, including its space activities, organization, industrial links, and infrared horizon sensors. Various types of horizon sensors from Sodern are presented, such as, static horizon sensors for circular orbit and three axis stabilized satellites; horizon acrossing sensor for spinning vehicles; and conical sensors for wide field coverage. Author (ESRO)

N75-31161 Contraves Corp., Zurich (Switzerland).
DEVELOPMENT OF A MASS OPTIMIZED EUROPEAN COMMUNICATIONS SATELLITE STRUCTURE c18
H. Schneiter, U. Schibli, J. J. Wijker (Fokker VFW), and A. Stroeve (ESRTC, Noordwijk, Neth.) *In* ESRO European Capabilities for Space Appl. 1975 12 p (For availability see N75-31129 22-12)

The primary structure of a 720 kg Thor Delta launched communications satellite is discussed. The target structural mass of 20 kg was obtained by systematic trade-off studies, the introduction of advanced materials, and consequent design optimization. The two-platform-concept structure consisted of adhesive bonded aluminum alloy components and used ultrathin carbon fiber reinforced plastic sandwich skins. Testing included mass and center of gravity measurements and static load (both stiffness and strength) tests. Thermal problems were analyzed and verified by corresponding tests. The structural reliability was theoretically investigated. Author (ESRO)

N75-31162 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
THERMAL CONTROL FOR COMMUNICATION SATELLITES c18
In ESRO European Capabilities for Space Appl. 1975 16 p (For availability see N75-31129 22-12)

The increase in standards on domestic and international communication satellites is briefly discussed, and the requirements on thermal control are characterized. Methods of solution and present trends of selected major problems are presented. Thermal control of large spacecraft antennas and the development of heat pipes and PCM-elements working as either latent heat reservoirs or thermo-optical reflectors are discussed. Author (ESRO)

N75-31163 Etudes Techniques et Constructions Aerospatiales, Charleroi (Belgium).
POWER CONDITIONING FOR COMMUNICATION SATELLITES c20
Andre Dumont *In* ESRO European Capabilities for Space Appl. 1975 8 p (For availability see N75-31129 22-12)

The history of the satellite power conditioning problem is discussed from low power scientific satellites via medium power satellites such as Meteosat, where a level of 400 W is needed, to higher power satellites. Future satellite missions are assessed, such as television broadcasting satellites where loads between 300 and 1000 W will be necessary. Two examples of power conditioning for a high power mission are given: a 4-channel direct TV broadcast satellite and a communication satellite using several low power transponders. ESRO

N75-31164 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
THE ULP FLATPACK HYBRID SOLAR ARRAY FOR FUTURE TELECOMMUNICATION SATELLITES c20
Henning vonBassewitz and Helmut Schweig *In* ESRO European Capabilities for Space Appl. 1975 14 p (For availability see N75-31129 22-12)

A flatpack hybrid solar array in the power range of 2 to 10 KW is described. The array consists of a pure carbon fiber framework with a flexible pretensioned solar cell substrate. The modular concept of identical subpanels allows easy adaption to power requirements. A 1 sqm panel was built and exposed to several qualification tests (acoustic noise, vibration). Array components were tested functionally and in view of their stability under space environment (CFC, solar cell blanket). Author (ESRO)

N75-31165 AEG-Telefunken, Hamburg (West Germany). Dept. of Space Technology and New Technologies.
SOLAR GENERATOR AND POWER SYSTEMS FOR COMMUNICATION SATELLITES c20
Rainer Hehnen and Joachim Rath *In* ESRO European Capabilities for Space Appl. 1975 14 p (For availability see N75-31129 22-12)

State of the art and development activities on solar generators are discussed. Power conditioning and power storage equipment, including onboard equipment and electrical ground support equipment, are also considered. ESRO

N75-31166 Societe Anonyme de Telecommunications, Paris (France).
SOLAR CELL TECHNOLOGY. POWER GENERATORS FOR COMMUNICATION SATELLITES c20
J. Fremy and A. Sorrentino *In* ESRO European Capabilities for Space Appl. 1975 13 p refs (For availability see N75-31129 22-12)

After a short presentation of the principle of photovoltaic conversion, the main characteristics of the solar cells presently used on satellites are described. Improvements already obtained on cell efficiency as well as present and future developments are analyzed. Starting from the requirements for the communication satellite solar arrays, the different technologies of interconnection of the solar cells are described. The realizations in the field of the communication satellite solar arrays (Intelsat 3 and 4, Symphonie, and Comsat foldable array) are reviewed, stating the different technologies used and the results obtained.
Author (ESRO)

N75-31167 Societe des Accumulateurs Fixes et de Traction, Romainville (France). Section Aerospatiale.
LONG LIFE COMMUNICATION SATELLITES: ELECTRIC POWER SUPPLY DURING THE ECLIPSE PERIOD [SATELLITES DE COMMUNICATION A GRANDE DUREE: FOURNITURE DE L'ENERGIE ELECTRIQUE] c20
S. Font *In* ESRO European Capabilities for Space Appl. 1975 9 p In FRENCH (For availability see N75-31129 22-12)

The electric batteries, essentially nickel-cadmium, for French satellites such as D1 A, D1 C, D1 D, D2 B, D5 A, D5 B, etc. and the batteries for such satellites as Symphonie, ANS, Intasat, ESRO 4, and COS-B are discussed. The experience obtained led to the development of long lifetime batteries for communication satellites. Real simulation tests showed a lifetime of four years and accelerated lifetime tests of twelve years. These batteries will be applied in OTS, Meteosat, and Marots. At the same time, new batteries are being developed, based on nickle-hydrogen or on silver-hydrogen, which should provide longer lifetimes and better reliability.
ESRO

N75-31168 Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain).
VHF ANTENNAS FOR COMMUNICATION SATELLITES (OTS) c17
In ESRO European Capabilities for Space Appl. 1975 9 p (For availability see N75-31129 22-12)

VHF antennas for communication satellites, allowing simultaneous transmission and reception of telemetry and telecommand signals, are described, including the development phase and specific characteristics of the OTS, VHF antenna subsystem. Methods used to determine the best antenna mounting location on the spacecraft are emphasized in order to comply with the coverage requirements for the various phases of the mission. INTA facilities and its experience in this area are dealt with.
ESRO

N75-31169 GTE-Telecomunicazioni S. p. A, Milano (Italy).
CRITICALITY ANALYSIS IN PARAMETRIC AMPLIFIERS FOR SATELLITE APPLICATIONS c19
Alessandro DAmbrosio *In* ESRO European Capabilities for Space Appl. 1975 10 p refs (For availability see N75-31129 22-12)

Most of the work was carried out on a Ku-band parametric amplifier, of which varactor capacitance, dc amplifier input network, and pump frequency drift are discussed. An attempt was made to find a correlation between the degradation, recorded during a 1000 hr life test on a complete unit, and the deviations of some measured parameters; furthermore, a possible interpretation of said deviations is given.
Author (ESRO)

N75-31170 Siemens A.G., Munich (West Germany). Tube Div.
HIGH POWER AMPLIFIERS FOR COMMUNICATIONS SATELLITES c20
Horst Seunik *In* ESRO European Capabilities for Space Appl. 1975 17 p (For availability see N75-31129 22-12)

Development of two travelling-wave tubes with directly radiating multistage collectors and their associated power supplies as part of a 700 W transponder for a direct TV broadcasting satellite and a 450 W transponder for a high power communications satellite, both operating in the 11.7 to 12.5 GHz band is described. Periodic focusing with permanent magnets is employed for both travelling-wave tubes. The tubes incorporate a new type of coupled cavity slow wave circuit comprising three gain sections with a velocity taper in the final section for efficiency improvement. The five-stage depressed collector for further efficiency improvement utilizes carbon-metal-ceramic technology to permit heat radiation directly into space. The power supplies for the tubes operate at an efficiency of more than 90%. They weigh about 11 kg and are designed for maximum reliability.
Author (ESRO)

N75-31171 AEG-Telefunken, Backnang (West Germany).
HIGH POWER TRANSMITTER AMPLIFIERS FOR COMMUNICATION SATELLITES c20
Jork Bretting and Diederich Koehn *In* ESRO European Capabilities for Space Appl. 1975 14 p (For availability see N75-31129 22-12)

Some typical examples of traveling wave tubes (twt) for frequencies from 4 to 12 GHz and with power outputs from 10 to 500 W are presented. The technology of both twt's and electronic power conditioners are discussed with respect to system parameters such as efficiency, mass, reliability, and life time.
Author (ESRO)

N75-31172 Valvo G.m.b.H., Hamburg (West Germany).
HIGH POWER KLYSTRON AMPLIFIERS FOR COMMUNICATION SATELLITES c20
Enzio Demmel *In* ESRO European Capabilities for Space Appl. 1975 15 p refs (For availability see N75-31129 22-12)

The klystron V43Sk, was developed for the transmission of a 30 NHz FM television channel with an output power of 1 kW. A low perveance beam is focused by a periodic permanent magnet using samarium-cobalt, thereby reducing the mass of the focusing system to 120 g. A total efficiency of 50% is realized by means of a 3-stage depressed collector. The collector concept can be adapted to different heat dissipation techniques, such as high or low temperature direct radiation. The 5-cavity klystron operates with a power gain of 30 db. The V73SK developed to meet the bandwidth requirement of a 100 MHz telecommunication channel with an output power of 450 W and a power gain of 46 dB is discussed. The large bandwidth called for a high perveance design thereby reducing power supply voltage to approx. 5 kV. A low temperature radiation cooled 5-stage collector is designed to raise total klystron efficiency to 50%. The design of the HF-section will include a filter output circuit for flat frequency response.
Author (ESRO)

N75-31173 Laboratoire Central de Telecommunications, Paris (France).
PARAMETRIC AMPLIFIERS FOR TELECOMMUNICATION GROUND STATIONS c14
J. Dupraz and M. Creach *In* ESRO European Capabilities for Space Appl. 1975 10 p (For availability see N75-31129 22-12)

The 1.7 GHz and 2.3 GHz (L-band and S-band) amplifiers recently developed for the Meteosat, GEOS, and IUE ground stations at ESOC, Germany, the 4 GHz amplifiers for Symphonie and Intelsat ground stations and for the CNES educational TV receiving stations, and the 11.6 GHz amplifiers for the European communication satellite are described. Main characteristics for each type are indicated.
ESRO

N75-31174 Siemens A.G., Munich (West Germany).
HIGH POWER TUBES IN GROUND-STATION-TECHNOLOGY c14
Konrad Poebl *In* ESRO European Capabilities for Space Appl. 1975 10 p refs (For availability see N75-31129 22-12)

In summarizing activities in the electron tube field, two different areas of applications are discussed: (1) terrestrially based communication systems (earth stations) and (2) spacecraft systems (satellite and space probes).
ESRO

N75-31175 Marconi Space and Defence System Ltd., Stanmore (England).
GROUND STATION TECHNOLOGY FOR COMMUNICATION SATELLITES c14
M. E. Cleverley and J. G. Chaplin *In* ESRO European Capabilities for Space Appl. 1975 11 p (For availability see N75-31129 22-12)

Available options and the limits of present and future performance are mentioned. The capabilities and achievements of the two Marconi companies are outlined, ranging in terminal size from shipborne terminals such as SCOT 1 (1,07 meter) to 30 meter Intelsat stations.
ESRO

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-31176 California Univ., Los Angeles.
THE GENERAL PROBLEM OF THREE BODIES: PERIODIC ORBITS AND THEIR STABILITY Ph.D. Thesis
Dale Hershel Boggs 1975 199 p
Avail: Univ. Microfilms Order No. 75-16772

The planar general three-body problem is described with respect to a nonrotating body centered coordinate frame and periodic orbits are computed for the resulting four degree-of-freedom system. These orbits are obtained as the numerically integrated vector solutions to a system of eight nonlinear, autonomous, first-order differential equations which describe the motion. Initial conditions are found which yield periodic solutions for a given period. Many such periodic orbits are determined covering a variety of non-collision motions and configurations in phase space and different mass ratios of the participating bodies, ranging from the equal-mass case to the restricted three-body problem where one of the masses is identically zero.
Dissert. Abstr.

N75-31177*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
DYNAMIC ANALYSIS OF THE LONG-TERM ZONAL EARTH ENERGY BUDGET EXPERIMENT (LZEEBE) SPACECRAFT
Leonard Meirovitch and Arthur L. Hale 1975 33 p refs
(Contract NAS1-10646)
(NASA-CR-132716) Avail: NTIS HC $3.75 CSCL 22A

The motions of the flexible LZEEBE spacecraft after injection into a circular orbit were analyzed. The spacecraft consists of three spherical balloons connected to a central hub by three long flexible booms which lie in a plane such that the angle between any pair of booms is 120 degrees. The major torques acting on the spacecraft are gravity-gradient torques and torques due to solar radiation pressure acting on the balloons which have different reflective properties. A development of the equations of motion is presented. Computer simulations indicate that the spacecraft will have random motion, provided the injection into orbit does not create conditions favorable to gravity-gradient capture.
Author

N75-31178*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FOURTEEN YEARS OF RESONANCE OF VANGUARD ORBITS
C. A. Wagner Jun. 1975 70 p refs Submitted for publication
(NASA-TM-X-70966; X-921-75-179) Avail: NTIS HC $4.25 CSCL 22A

Tracking of Vanguard 3 and the Vanguard 2 rocket with Baker-Nunn cameras and the U.S. Navy's Space Surveillance (radio interferometer) system over a 14 year period revealed resonant fluctuations of up to 0.035 deg in inclination (peak to peak). Six geopotential terms (lumped coefficients) of 11th order and three of 22nd order were measured using orbit inclinations derived from this tracking record. The terms of 11th order are significantly smaller than Kaula's rule. (The lumped coefficients are sensitive to geopotential effects as high as 37th degree.) These observed terms are compatible with a recent 27-satellite geopotential solution whose formal coefficient errors are increased by a factor of 3.3.
Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N75-31179*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LIBRA: AN INEXPENSIVE GEODETIC NETWORK DENSIFICATION SYSTEM
Henry F. Fliegel, Marvin Gantsweg, and P. S. Callahan 15 Aug. 1975 98 p refs
(Contract NAS7-100)
(NASA-CR-143486; JPL-TM-33-725) Avail: NTIS HC $4.75 CSCL 14B

A description is given of the Libra (Locations Interposed by Ranging Aircraft) system, by which geodesy and earth strain measurements can be performed rapidly and inexpensively to several hundred auxiliary points with respect to a few fundamental control points established by any other technique, such as radio interferometry or satellite ranging. This low-cost means of extending the accuracy of space age geodesy to local surveys provides speed and spatial resolution useful, for example, for earthquake hazards estimation. Libra may be combined with an existing system, Aries (Astronomical Radio Interferometric Earth Surveying) to provide a balanced system adequate to meet the geophysical needs, and applicable to conventional surveying. The basic hardware design was outlined and specifications were defined. Then need for network densification was described. The following activities required to implement the proposed Libra system are also described: hardware development, data reduction, tropospheric calibrations, schedule of development and estimated costs.
Y.J.A.

N75-31180# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, JULY 1974
R. D. Eberst 14 Aug. 1974 27 p
(ROE-STS-192) Avail: NTIS HC $3.75

Optical observations of satellites made at the Willowbrae station during July 1974 were recorded with a stopwatch and are listed in satellite launch order and in time order for each satellite. A total of 451 fully recorded observations of 120 satellites are tabulated.
Author (ESRO)

N75-31181# Groupe de Recherches Ionospheriques, Issy-les-Moulineaux (France).
PRELIMINARY TEST OF THE ELECTROMAGNETIC CLEANLINESS OF THE GEOS BAC TEST CHAMBER AND ENVIRONMENTAL NOISE TESTS OF THE HAFREN SITE IN U/ELF AND VLF FREQUENCY RANGES
B. DuboysDeLavigerie, J. F. Karczewski, A. Meyer, and F. X. Sene May 1974 17 p
(GRI/NTP/130) Avail: NTIS HC $3.25

Two sites, Filton and Hafren, were tested for the integration of the Geos satellite. The electromagnetic cleanliness of the test chamber (without door and with or without seismic bloc) was tested in Filton; the Hafren site was tested for environmental noise with magnetic sensors and electric receivers for horizontal and vertical components. Results show that except in the very low frequency range the two sites are equivalent. The Hafren site however is not acceptable without a shielded facility. ESRO

N75-31143 European Space Operations Center, Darmstadt (West Germany).
GEOSTATIONARY SATELLITES AND GROUND SUPPORT FACILITIES
G. Formica *In* ESRO European Capabilities for Space Appl. 1975 30 p (For availability see N75-31129 22-12)

N75-31144 Conference Europeenne des Administrations des Postes et des Telecommunications (CEPT), Rome (Italy).
TELECOMMUNICATION GROUND STATIONS IN THE EUROPEAN TELECOMMUNICATION SATELLITE PROGRAM [LES STATIONS TERRIENNES DE TELECOMMUNICATIONS DU PROGRAMME EUROPEEN DE TELECOMMUNICATIONS PAR SATELLITE]
J. P. Houssin *In* ESRO European Capabilities for Space Appl. 1975 7 p In FRENCH (For availability see N75-31129 22-12)

N75-31145 AEG-Telefunken, Backnang (West Germany).
OTS SCTS: THE GROUND STATION FOR IN-ORBIT OPERATION OF THE OTS

Peter Bodenstein and Martin Boerner *In* ESRO European Capabilities for Space Appl. 1975 11 p (For availability see N75-31129 22-12)

N75-31146 Telspace, Paris (France).
TECHNOLOGY OF GROUND STATIONS OF THE EUROPEAN SATELLITE COMMUNICATION SYSTEM [TECHNOLOGIE DES STATIONS TERRIENNES DES SYSTEMES EUROPEENS DE TELECOMMUNICATIONS PAR SATELLITE]
A. Blanchi and J. Salomon *In* ESRO European Capabilities for Space Appl. 1975 35 p In FRENCH (For availability see N75-31129 22-12)

N75-31173 Laboratoire Central de Telecommunications, Paris (France).
PARAMETRIC AMPLIFIERS FOR TELECOMMUNICATION GROUND STATIONS
J. Dupraz and M. Creach *In* ESRO European Capabilities for Space Appl. 1975 10 p (For availability see N75-31129 22-12)

N75-31174 Siemens A.G., Munich (West Germany).
HIGH POWER TUBES IN GROUND-STATION-TECHNOLOGY
Konrad Poebl *In* ESRO European Capabilities for Space Appl. 1975 10 p refs (For availability see N75-31129 22-12)

N75-31175 Marconi Space and Defence System Ltd., Stanmore (England).
GROUND STATION TECHNOLOGY FOR COMMUNICATION SATELLITES
M. E. Cleverley and J. G. Chaplin *In* ESRO European Capabilities for Space Appl. 1975 11 p (For availability see N75-31129 22-12)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-31182*# Texas Univ., Austin. Applied Mechanics Research Lab.
THE EQUATIONS OF MOTION OF AN ARTIFICIAL SATELLITE IN NONSINGULAR VARIABLES
Giorgio E. O. Giacaglia Aug. 1975 81 p refs
(Grant NGR-44-012-269)
(NASA-CR-143499; AMRL-1072) Avail: NTIS HC $4.75 CSCL 22C

The equations of motion of an artificial satellite are given in nonsingular variables. Any term in the geopotential is considered as well as luni-solar perturbations up to an arbitrary power of r/r prime; r prime being the geocentric distance of the disturbing body. Resonances with tesseral harmonics and with the moon or sun are also considered. By neglecting the shadow effect, the disturbing function for solar radiation is also developed in nonsingular variables for the long periodic perturbations. Formulas are developed for implementation of the theory in actual computations. Author

N75-31183*# Analytical Mechanics Associates, Inc., Seabrook, Md.
PROGRAM SELECTION, MODIFICATION AND THE DEMONSTRATION OF A BASELINE TRAJECTORY SIMULATION FOR THE LDEF MISSION
J. B. Eades, Jr. and H. Wolf Jul. 1975 70 p refs
(Contract NAS1-13143)
(NASA-CR-132726; AMA-75-20) Avail: NTIS HC $4.25 CSCL 22B

The selection, conversion, and modification of computer programs to be used for the long duration exposure facility (LDEF) mission analysis studies is described. Selected output from these programs is illustrated and discussed. Program capabilities are demonstrated and a baseline solution typical to the LDEF orbital operation is provided. Author

N75-31184*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WIND TUNNEL INVESTIGATION OF A CENTAUR STANDARD SHROUD COMPARTMENT VENT FROM MACH NUMBER OF 0.70 TO 1.96
Albert L. Johns and Merle L. Jones Aug. 1975 91 p refs
(NASA-TM-X-71759; E-8461) Avail: NTIS HC $4.75 CSCL 20D

An experimental investigation was conducted in the Lewis Research Center 8- by 6-foot supersonic wind tunnel to determine the vent discharge coefficient for the Centaur standard shroud/liquid hydrogen tank compartment vent. The test was conducted from Mach 0.70 to 1.96 with the vent mounted in a flat plate. Full scale simulated flight hardware, such as the vent, corrugations, aft field joint ring and ice bag clip was used. Air was discharged from a plenum chamber, located on the tunnel sidewall behind the plate, through five 6.35 cm diameter vent orifices into the free stream. Boundary layer thickeners, analytically predicted displacement thickness for the vehicle nominal flight trajectory could be simulated over the Mach number range. The highest vent discharge coefficient for any given Mach number and vent pressure ratio generally occurred at the maximum displacement thickness. Author

N75-31185# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
KINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 12
K. S. Russell 28 May 1974 40 p ref
(ROE-STS-183-Pt-12) Avail: NTIS HC $3.75

Timed observation of satellites made in azimuth and elevation with a kinetheodolite at Earlyburn Outstation, are listed in satellite launch and time order. Fully reduced observations of 34 transits of satellites are presented. Author (ESRO)

N75-31186# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
KINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 13
K. S. Russell 31 May 1974 36 p ref
(ROE-STS-184) Avail: NTIS HC $3.75

Timed observations, of satellites made in azimuth and elevation with a kinetheodolite at Earlyburn Outstation, are listed in satellite launch and time order: fully reduced observations of 30 transits of satellites 1964-06 A, 1964-11 A, 1964-15 A, and 1964-15 B are given. Author (ESRO)

N75-31187# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
KINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 14
K. S. Russell 3 Jun. 1974 35 p ref
(ROE-STS-185-Pt-14) Avail: NTIS HC $3.75

Timed observations of the azimuth and elevation angle of satellite transits, taken with a kinetheodolite at Earlyburn Outstation during the observing year 1964 - 1965 are listed in satellite launch order and in time order for each satellite. Fully reduced observations of 29 transits of 6 satellites are tabulated. Author (ESRO)

N75-31188# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
KINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 15
K. S. Russell 4 Jun. 1974 34 p ref
(ROE-STS-186-Pt-15) Avail: NTIS HC $3.75

Timed observations of the azimuth and elevation angle of satellite transits, taken with a kinetheodolite at Earlyburn Outstation during the observing year 1964 - 1965, are listed in satellite launch order and in time order for each satellite. Fully reduced observations of 28 transits of 6 satellites are tabulated. Author (ESRO)

N75-31189# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, MAY 1974
R. D. Eberst 10 Jun. 1974 21 p

(ROE-STS-190) Avail: NTIS HC $3.25

Optical observations of satellites made at the Willowbrae and the Walthamstow stations during May 1974 were recorded with a stopwatch and are listed in satellite launch order and in time order for each satellite. A total of 451 fully reduced observations of 120 satellites are tabulated. Author (ESRO)

N75-31190# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.

STOPWATCH OBSERVATIONS OF SATELLITES, JUNE 1974

R. D. Eberst 10 Jul. 1974 12 p

(ROE-STS-191) Avail: NTIS HC $3.25

Optical observations of satellites made at the Willowbrae and the Walthamstow stations during June 1974 were recorded with a stopwatch and are listed in satellite launch order and in time order for each satellite. A total of 98 fully reduced observations for 35 satellites are tabulated. Author (ESRO)

N75-31191# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.

KINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 18

K. S. Russell 7 Jun. 1974 38 p ref

(ROE-STS-189-Pt-18) Avail: NTIS HC $3.75

Timed observations of satellites, made in azimuth and elevation with a kinetheodolite at Earlyburn Outstation, are listed in launch and time order. Fully reduced observations of 30 transits of satellites are presented. Author (ESRO)

N75-31192# Academy of Sciences (USSR), Moscow. Inst. for Space Research.

INFLUENCE OF SHORT-PERIODIC VARIATIONS OF THE ATMOSPHERIC DENSITY ON AN ACCURACY OF CLOSE AES ORBIT CALCULATIONS

P. E. Elyasberg, B. V. Kugaenko, and M. I. Voiskovsky 1974 33 p refs

(D-187) Avail: NTIS HC $3.75

The effects of short periodic variations of atmospheric density on the accuracy of calculations of AES orbits with low perigees are considered. It was assumed that the effects of long periodic variations of density is taken into account by using the atmospheric model. The influence of the following types of density cariations were estimated: variations correlating with a geomagnetic disturbance, random variations proportional to a solar radio radiation intensity, and random variations of density not described by the chosen density model. Statistical characteristics for the first two types of variations can be obtained by using the appropriate processing of the index values. The characteristics for the third type are defined as a function of the analysis of residuals appearing after refinement of the coefficients for the density model. Calculations errors for the interval of an orbit prediction and for the interval of the agreement of the AES average dragging, based on the results of two adjacent determinations of an orbit, are analyzed. Author (ESRO)

N75-31193# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.

STOPWATCH OBSERVATIONS OF SATELLITES, FEBRUARY 1975

R. D. Eberst 12 Mar. 1975 25 p

(ROE-SRS-199) Avail: NTIS HC $3.25

Optical observations of satellites made at the Willowbrae station during February 1975 were recorded with a stopwatch and are listed in satellite launch order and in time order for each satellite. A total of 417 fully reduced observations of 108 satellites are tabulated. Author (ESRO)

N75-31194# Transportation Systems Center, Cambridge, Mass.

TARGET ACQUISITION PERFORMANCE OF A SATELLITE BASED MULTIPLE ACCESS SURVEILLANCE SYSTEM Final Report, Nov. 1972 - Nov. 1973

H. D. Goldfein Nov. 1973 98 p refs

(PB-241633/7; DOT-TSC-OST-73-27) Avail: NTIS HC $4.75 CSCL 17G

This system is one which was proposed for CONUS coverage in an advanced air traffic control system. The computer program which was used to simulate the random access surveillance link for this system is described. This computer program is applicable for analysis of a broad range of random access surveillance systems. GRA

N75-31195# Boston Coll., Chestnut Hill, Mass. Data Analysis Lab.

ATTITUDE DETERMINATION TECHNIQUES FOR ROCKETS WITH INERTIAL MEASURING SYSTEMS Final Report, 18 Oct. 1972 - 17 Oct. 1974

Brian F. Sullivan, Marvin E. Stick, and Rene J. Marcou 30 Nov. 1974 69 p refs

(Contract F19628-73-C-0093)

(AD-A009633; AFCRL-TR-75-0087) Avail: NTIS CSCL 19/7

The implementation of procedures used to calculate the attitude of a rocket from its transmitted gyroscopic roll, pitch, and yaw signals is discussed. The differences and the angular conversions of the output from various inertial attitude systems are presented. Also, a synopsis of the mathematical analysis used to compute attitude is presented. In addition, analyses and data reduction techniques are developed to determine the attitude of the Ute-Tomahawk rocket A09.209-1, fired 16 April 1973 at White Sands Missile Range, New Mexico. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N75-31196*# Airborne Instruments Lab., Deer Park, N.Y.

LOW COST TRACKING NAVAIDS ERROR MODEL VERIFICATION Final Report

A. Charych, A. Tatz, J. Lovell, and R. Frederick May 1975 125 p refs

(Contract NAS9-14151; AIL Proj. CO11-1)

(NASA-CR-144443) Avail: NTIS HC $5.25 CSCL 17G

Features and characteristics of the tracking navaids (Microwave Scanning Beam Landing System, Radar Altimeter, Tacan, rendezvous radar and one way Doppler extracter) were investigated. From the investigation, a set of specifications were developed for building equipment to verify the error model of the tracking navaids. Breadboard verification equipment (BVE) was built for the Microwave Scanning Beam Landing System and the radar altimeter. The breadboard verification equipment generates signals to the tracking navaids which simulate the space shuttles trajectory in the terminal area. The BVE simulates sources of navaids error by generating pseudorandom perturbations on the navaids signals. Differences between the trajectory value and the navaid derived values are taped and form the basis for the navaids error model. Author

N75-31197*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AN ANALYSIS OF SPACECRAFT DATA TIME TAGGING ERRORS

Ai Chun Fang Washington Sep. 1975 34 p refs

(NASA-TN-D-8073; G-7607) Avail: NTIS HC $3.75 CSCL 17B

An indepth examination of the timing and telemetry in just one spacecraft points out the genesis of various types of timing errors and serves as a guide in the design of future timing/telemetry systems. The principal sources of timing errors are examined carefully and are described in detail. Estimates of these errors are also made and presented. It is found that the timing errors within the telemetry system are larger than the total timing errors resulting from all other sources. Author

N75-31198# Radio Corp. of America, Cape Kennedy, Fla.
DESIGN VERIFICATION PROGRAM AIRBORNE INSTRUMENTATION SYSTEM
E. T. Johnson 28 May 1974 16 p
(Contract F08606-74-C-0025)
(AD-A008712; RCA/TELTA-TR-74-051; AFETR-TR-75-23)
Avail: NTIS CSCL 14/2

The report discusses the measurement requirements levied as a result of the Design Verification Program and the actions taken to satisfy these requirements. The report is not intended to describe test results. Instead the report is technical in nature and describes the instrumentation which was selected to provide the required telemetry system. GRA

N75-31199# Radio Corp. of America, Cape Kennedy, Fla.
CEFAR YONDER AIRBORNE/GROUND INSTRUMENTATION SYSTEMS
E. T. Johnson 7 Jun. 1974 22 p
(Contracts F08606-73-C-0019; F08606-73-C-0021; F08606-73-C-0041)
(AD-A008714; RCA/TELTA-TR-74-060; AFETR-TR-75-27)
Avail: NTIS CSCL 14/2

The report describes the airborne and ground instrumentation systems which were designed and fabricated for the CEFAR YOUNDER balloon program. The report defines the program requirements originating from design parameters. Specific capabilities are discussed in detail. GRA

N75-31200# Naval Research Lab., Washington, D.C.
JOINT NRL/NELC OPTICAL-SATELLITE-COMMUNICATION ATMOSPHERIC-PROPAGATION TEST PLAN
P. M. Livingston, G. L. Trusty, L. H. Ruhnke, and G. Mooradian
Apr. 1975 77 p refs
(NRL Proj. N03-25)
(AD-A009736) Avail: NTIS CSCL 17/2

An experimental program has been planned to test the hypothesis that optical communication systems based on the heterodyne principle can be used for practical Navy ship/satellite communications through clouds of moderate thickness. The Island of Hawaii has been chosen as the site of a major field effort by NRL and NELC because the trade winds drive typical marine orographic clouds through an elevated mountain pass reproducibly on a daily basis, the mountain pass is accessible by road, and (as is summarized herein) the clouds there have already been well studied. A theoretical formulation based on radiation transport theory shows that the reliability of an optical heterodyne communication system can be expressed as a function of the cloud properties. The experiments will test the relationship between a system carrier-to-noise ratio (C/N) and cloud properties. They will establish the averaging times necessary for a meaningful C/N, determine the relationship between C/N and the optical-thickness and droplet-size parameters of the cloud, relate reproduction of clear-path C/N values, averaged mean-square wavefront tilt received, and optical turbulence, and measure the reduction of C/N in a cloud as the receiver (or transmitter) is pointed off-axis (thus examining the security of a system). GRA

N75-31141 Selenia S.p.A., Rome (Italy). Space and Telecommunication Div.
THE OTS/ECS ANTENNAS: A HIGH TECHNOLOGY ANTENNA SYSTEM DEVELOPMENT
Andrea Marri *In* ESRO European Capabilities for Space Appl. 1975 17 p (For availability see N75-31129 22-12)

N75-31142 Marconi Space and Defence Systems Ltd., Portsmouth (England).
THE MAROTS COMMUNICATION PAYLOAD
Derek Mclauchlan *In* ESRO European Capabilities for Space Appl. 1975 13 p (For availability see N75-31129 22-12)

N75-31154 Laboratoire Central de Recherches Thomson-CSF, Orsay (France). Space Dept.
POSSIBLE EVOLUTION OF COMMUNICATION SATELLITE PAYLOADS [EVOLUTION POSSIBLE DES CHARGES UTILES DE SATELLITES DE TELECOMMUNICATIONS]
C. Skenderoff *In* ESRO European Capabilities for Space Appl. 1975 20 p In FRENCH (For availability see N75-31129 22-12)

N75-31168 Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain).
VHF ANTENNAS FOR COMMUNICATION SATELLITES (OTS)
In ESRO European Capabilities for Space Appl. 1975 9 p (For availability see N75-31129 22-12)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N75-31201*# TRW Systems Group, Redondo Beach, Calif. Management Engineering Dept.
SPACE SHUTTLE CONFIGURATION ACCOUNTING FUNCTIONAL DESIGN SPECIFICATION
8 Feb. 1974 64 p
(Contract NAS9-13140)
(NASA-CR-144405; TRW-23144-H001-RO-00) Avail: NTIS HC $4.25 CSCL 22B

An analysis is presented of the requirements for an on-line automated system which must be capable of tracking the status of requirements and engineering changes and of providing accurate and timely records. The functional design specification provides the definition, description, and character length of the required data elements and the interrelationship of data elements to adequately track, display, and report the status of active configuration changes. As changes to the space shuttle program levels II and III configuration are proposed, evaluated, and dispositioned, it is the function of the configuration management office to maintain records regarding changes to the baseline and to track and report the status of those changes. The configuration accounting system will consist of a combination of computers, computer terminals, software, and procedures, all of which are designed to store, retrieve, display, and process information required to track proposed and proved engineering changes to maintain baseline documentation of the space shuttle program levels II and III. Author

N75-31202*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF AN EXTERNAL TANK SEPARATION TEST IN AEDC/VKF TUNNEL B ON 0.010-SCALE REPLICA OF SPACE SHUTTLE VEHICLE MODEL 52-OT(IA17A), VOLUME 1
R. H. Spangler (Rockwell Intern. Corp., Downey, Calif.) and J. J. Daileda (Rockwell Intern. Corp., Downey, Calif.) 9 Sep. 1975 658 p
(Contract NAS9-13247)
(NASA-CR-141797; DMS-DR-2156-Vol-1) Avail: NTIS HC $15.25 CSCL 22B

Tests were conducted on scale models of the space shuttle orbiter and external tank (ET) to determine the aerodynamic interactions during a return to launch site abort separation. The orbiter model was built to vehicle 3 configuration lines (1398) and the ET model approximated the vehicle 5 configurations with protuberances and attach hardware. For these investigations the orbiter was mounted on the primary support system and the external tank was mounted on the captive trajectory system. Six-component data were obtained for each vehicle at various orbiter angles of attack and sideslip for a range of relative

angular and linear displacements of the ET from the orbiter.
Author

N75-31203*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF AN EXTERNAL TANK SEPARATION TEST IN THE AEDC/VKF TUNNEL B ON AN 0.010-SCALE REPLICA OF THE SPACE SHUTTLE VEHICLE MODEL 52-OT (IA17A), VOLUME 2
R. H. Spangler and J. J. Daileda Jul. 1975 809 p Prepared by Rockwell Intern. Corp.
(Contract NAS9-13247)
(NASA-CR-141798; DMS-DR-2156-Vol-2) Avail: NTIS HC $19.25 CSCL 22B
For abstract, see N75-31202.

N75-31204*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF AN EXTERNAL TANK SEPARATION TEST IN THE AEDC/VKF TUNNEL B ON AN 0.010-SCALE REPLICA OF THE SPACE SHUTTLE VEHICLE MODEL 52-OT (IA17A), VOLUME 3
R. H. Spangler and J. J. Daileda Jul. 1975 663 p Prepared by Rockwell Intern. Corp.
(Contract NAS9-13247)
(NASA-CR-141799; DMS-DR-2156-Vol-3) Avail: NTIS HC $15.25 CSCL 22B
For abstract, see N75-31202.

N75-31205# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
OPTIMAL AND SUBOPTIMAL LAWS FOR SIMPLE HOMING SYSTEMS
J. K. Hammond Mar. 1975 70 p refs
(Contract MIN-DEF/PE-AT/2040/089/GC)
(AASU-337) Avail: NTIS HC $4.25
Optimal control studies were carried out on a homing missile with an autopilot. The missile model includes a simple lag, the target is assumed to perform random maneuvers, and sensor noise is included. Optimal control theory was used to derive a feedback controller which was shown to be approximated by a simple pole cancellation type of law together with feedback of target maneuver. This was then modified to a phase advance form in order to cope with noisy measurements of line of sight rate. The performance of this suboptimal system was assessed and compared with that of conventional proportional navigation.
Author (ESRO)

N75-31206# European Space Research Organization, Paris (France).
THEORETICAL AND EXPERIMENTAL STUDIES OF ANNULAR NUTATION DAMPERS
Werner Koeppen Mar. 1975 171 p refs Transl. into ENGLISH of "Theoretische u. exptl. Untersuch. an ringfoermigen Fluessigkeit-snutationsdaempfern", DFVLR, Oberpfaffenhofen, West Ger. Report DLR-FB-74-06, 1974 Original German report available from DFVLR, Porz, West Ger. 53.20 DM
(ESRO-TT-152; DLR-FB-74-06) Avail: NTIS HC $6.25
The dynamics of the annular liquid damper were analyzed based on a simple module. Experimental results are in good agreement with qualitative predictions of this analysis. An approximate calculation of characteristics damping parameters are achieved by assuming that the frictional force on the fluid is less than one would expect for turbulent flow. Mercury was used as the damper fluid. For the experimental investigations a laboratory simulator and a device for measuring the nutation angle were developed. For very small nutation angles the disturbing torques caused by frictional forces on the simulator are of the magnitude of about 0.1 pcm.
Author (ESRO)

N75-31207# Rockwell International Corp., Downey, Calif. Space Div.
SPACECRAFT OPTICAL AND THERMAL MODEL Final Report, 4 Feb. 1974 - 28 Feb. 1975
R. S. H. Hallstein Mar. 1975 93 p
(Contract F30602-74-C-0113; ARPA Order 2646)
(AD-A008789; RADC-TR-75-90) Avail: NTIS CSCL 22/1
A 1/10 scale model of spacecraft P72-2 was fabricated primarily from wood with adhesive application of surface covering materials identical to those applied to the full spacecraft. Actual solar cells and reflecting mirrors were also installed on the model in order to accurately reproduce their unique spectral reflectance characteristics. A thermal model for the P72-2 spacecraft with payloads was developed from the thermal model for the P72-2 alone. Indications are that in sun lit orbit, steady state temperatures will be similar to transient temperature. However, during eclipse periods, temperature excursions are large and transient data are significant.
GRA

N75-31208# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A COMPLETE STATE CONTROL AND I/O SYSTEM FOR THE D17B COMPUTER M.S. Thesis
James R. Harris Dec. 1974 115 p refs
(AD-A008667; GE/EE/74-47) Avail: NTIS CSCL 16/4
This paper presents the results of a study and design effort concerning the use of the D17B Computer in a general-purpose minicomputer-type data system. The project resulted in a highly effective and efficient user-oriented hardware system for state control and I/O interface. The primary goals for the system were high reliability and low cost in an easily expandable and understandable system which would facilitate system functions for both the programmer and the system operator.
GRA

N75-31157 British Aircraft Corp., Stevenage (England).
GIMBALLED MOMENTUM WHEEL SYSTEM: ATTITUDE CONTROL CONCEPT FOR COMMUNICATIONS SATELLITES
J. A. Holt *In* ESRO European Capabilities for Space Appl. 1975 15 p (For availability see N75-31129 22-12)

N75-31158 Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
GIMBALLED MOMENTUM WHEELS: RELIABLE ACTUATORS FOR SATELLITE ATTITUDE CONTROL
W. D. Limpert *In* ESRO European Capabilities for Space Appl. 1975 15 p (For availability see N75-31129 22-12)

N75-31159 Officine Galileo S.p.A., Florence (Italy).
INFRARED HORIZON SENSORS FOR APPLICATION SATELLITES
In ESRO European Capabilities for Space Appl. 1975 22 p (For availability see N75-31129 22-12)

N75-31160 Societe Anonyme d'Etudes et Realisations Nucleaires, Limeil-Breuannes (France).
INFRARED HORIZON SENSORS FOR APPLICATION SATELLITES
F. Desvignes *In* ESRO European Capabilities for Space Appl. 1975 12 p (For availability see N75-31129 22-12)

N75-31161 Contraves Corp., Zurich (Switzerland).
DEVELOPMENT OF A MASS OPTIMIZED EUROPEAN COMMUNICATIONS SATELLITE STRUCTURE
H. Schneiter, U. Schibli, J. J. Wijker (Fokker VFW), and A. Stroeve (ESRTC, Noordwijk, Neth.) *In* ESRO European Capabilities for Space Appl. 1975 12 p (For availability see N75-31129 22-12)

N75-31162 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
THERMAL CONTROL FOR COMMUNICATION SATELLITES
In ESRO European Capabilities for Space Appl. 1975 16 p (For availability see N75-31129 22-12)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N75-31169 GTE-Telecomunicazioni S. p. A. Milano (Italy).
CRITICALITY ANALYSIS IN PARAMETRIC AMPLIFIERS

FOR SATELLITE APPLICATIONS
Alessandro DAmbrosio *In* ESRO European Capabilities for Space Appl. 1975 10 p refs (For availability see N75-31129 22-12)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N75-31209*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH-PRESSURE OXYGEN TEST EVALUATIONS
Robert J. Schwinghamer and Carlo F. Key 29 Nov. 1974 25 p refs
(NASA-TM-X-64899) Avail: NTIS HC $3.25 CSCL 21H

The relevance of impact sensitivity testing to the development of the space shuttle main engine is discussed in the light of the special requirements for the engine. The background and history of the evolution of liquid and gaseous oxygen testing techniques and philosophy is discussed also. The parameters critical to reliable testing are treated in considerable detail, and test apparatus and procedures are described and discussed. Materials threshold sensitivity determination procedures are considered and a decision logic diagram for sensitivity threshold determination was plotted. Finally, high-pressure materials sensitivity test data are given for selected metallic and nonmetallic materials. Author

N75-31210*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACCELERATED LIFE TEST OF SPUTTERING AND ANODE DEPOSIT SPALLING IN A SMALL MERCURY ION THRUSTER
John L. Power Washington Sep. 1975 40 p refs
(NASA-TM-X-3269; E-8152) Avail: NTIS HC $3.75 CSCL 21C

Tantalum and molybdenum sputtered from discharge chamber components during operation of a 5 centimeter diameter mercury ion thruster adhered much more strongly to coarsely grit blasted anode surfaces than to standard surfaces. Spalling of the sputtered coating did occur from a coarse screen anode surface but only in flakes less than a mesh unit long. The results were obtained in a 200 hour accelerated life test conducted at an elevated discharge potential of 64.6 volts. The test approximately reproduced the major sputter erosion and deposition effects that occur under normal operation but at approximately 75 times the normal rate. No discharge chamber component suffered sufficient erosion in the test to threaten its structural integrity or further serviceability. The test indicated that the use of tantalum-surfaced discharge chamber components in conjunction with a fine wire screen anode surface should cure the problems of sputter erosion and sputtered deposits spalling in long term operation of small mercury ion thrusters. Author

N75-31211*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 1: ANALYTICAL MANUAL
P. E. Hong, G. L. Shults, R. J. Boain, K. R. Huling, and T. Wilson Oct. 1974 148 p refs Revised
(Contract NAS8-29666)
(NASA-CR-143934) Avail: NTIS HC $5.75 CSCL 21C

The mission analysis program for solar electric propulsion (MAPSEP) is comprised of the basic modes: TOPSEP (trajectory generation), GODSEP (linear error analysis), and SIMSEP (simulation). The program is designed to analyze any low thrust mission with respect to trajectory performance, guidance and navigation, and to provide system related requirements for the purpose of vehicle design. The MAPSEP organization is described along with all models and algorithms. Topics discussed include: trajectory and error covariance propagation methods, orbit determination processes, thrust modeling, and trajectory correction (guidance) schemes. J.M.S.

N75-31212*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 2: USER'S MANUAL
G. L. Shults, R. J. Boain, K. R. Huling, T. Wilson, and P. E. Hong Oct. 1974 185 p refs Revised
(Contract NAS8-29666)
(NASA-CR-143935) Avail: NTIS HC $7.00 CSCL 21C

A user's manual which describes input/output routines and recommended operating procedures relating to MAPSEP is presented. Samples runs are included. J.M.S.

N75-31213*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 3: PROGRAM MANUAL
K. R. Huling, R. J. Boain, T. Wilson, P. E. Hong, and G. L. Shults Oct. 1974 584 p refs Revised
(Contract NAS8-29666)
(NASA-CR-143936) Avail: NTIS HC $13.25 CSCL 21C

The internal structure of MAPSEP is described. Topics discussed include: macrologic, variable definition, subroutines, and logical flow. Information is given to facilitate modifications to the models and algorithms of MAPSEP. J.M.S.

N75-31214# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany).
STATE-OF-THE-ART OF AEROSPACE PROPULSION SYSTEMS IN THE FEDERAL REPUBLIC OF GERMANY
3 Apr. 1975 78 p In GERMAN; ENGLISH summary
(DGLR-Mitt-75-08) Avail: NTIS HC $4.75; DFVLR, Cologne DM 26

Results of inquiries made in industry, research facilities, and universities are given. Air breathing, solid and liquid chemical, and electric propulsion activities are listed and development trends outlined. ESRO

N75-31215# European Space Research and Technology Center, Noordwijk (Netherlands).
CATALOGUE OF PROPULSION MOTORS FOR SPACECRAFT
R. L. Mory, comp. and A. P. Findlay, comp. Paris ESRO [1975] 162 p In ENGLISH and FRENCH
(ESRO-SP-96-ESTEC) Avail: NTIS HC $6.25

Information on solid and liquid propellant rocket for spacecraft application is presented. Engines considered are those associated with the launch of spacecraft into orbit, and their propulsion and maneuverability. The catalog resulted from a questionnaire action and covers manufacturers in Western Europe, the United States, and Japan. ESRO

N75-31216# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
SOLID MOTOR SPACECRAFT INTERFACES Final Report
Ellis M. Landsbaum 3 Nov. 1974 13 p refs
(Contract F04701-74-C-0075)
(AD-A009140; TR-0075(5419-01)-4; SAMSO-TR-75-108) Avail: NTIS CSCL 21/8

The origin of the requirements and the resulting specifications for solid propellant rocket motors used with spacecraft are discussed. Typical specification values that have been used previously are presented. Specifications discussed are total impulse, thrust level, thrust alignment, temperature, plumes and contamination, spin rate, vibration and shock, center of gravity and balance. GRA

N75-31217# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab. Section.
SURVEILLANCE REPORT. STAGE 1: DISSECTED MOTORS, PHASE 6 Semiannual Report
John A. Thompson Apr. 1975 73 p
(AD-A009180; MANCP-319(75)) Avail: NTIS CSCL 21/8

Testing was performed to determine the useful shelf/service

life for LGM-30 Stage I Rocket Motors. A three year storage program for propellant and components was started in May 1961. The program was then extended to a ten-year study. The ten year program was continued to assure at least a two year extended life for propellant and components. This report covers propellant and case bond data. The malfunction of an environmental chamber and the burning of motors during dissection destroyed the component samples. Dissection of selected motors in the future should provide continued component testing. GRA

N75-31155 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
DEVELOPMENT OF THE SYMPHONIE APOGEE BOOST MOTOR
Manfred A. Schwende *In* ESRO European Capabilities for Space Appl. 1975 10 p (For availability see N75-31129 22-12)

N75-31156 Societe Europeenne de Propulsion, Bordeaux (France).
SOLID APOGEE BOOST MOTOR DEVELOPMENT
Wazir Asad *In* ESRO European Capabilities for Space Appl. 1975 11 p (For availability see N75-31129 22-12)

N75-31163 Etudes Techniques et Constructions Aerospatiales, Charleroi (Belgium).
POWER CONDITIONING FOR COMMUNICATION SATELLITES
Andre Dumont *In* ESRO European Capabilities for Space Appl. 1975 8 p (For availability see N75-31129 22-12)

N75-31164 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
THE ULP FLATPACK HYBRID SOLAR ARRAY FOR FUTURE TELECOMMUNICATION SATELLITES
Henning vonBassewitz and Helmut Schweig *In* ESRO European Capabilities for Space Appl. 1975 14 p (For availability see N75-31129 22-12)

N75-31165 AEG-Telefunken, Hamburg (West Germany). Dept. of Space Technology and New Technologies.
SOLAR GENERATOR AND POWER SYSTEMS FOR COMMUNICATION SATELLITES
Rainer Hehnen and Joachim Rath *In* ESRO European Capabilities for Space Appl. 1975 14 p (For availability see N75-31129 22-12)

N75-31166 Societe Anonyme de Telecommunications, Paris (France).
SOLAR CELL TECHNOLOGY. POWER GENERATORS FOR COMMUNICATION SATELLITES
J. Fremy and A. Sorrentino *In* ESRO European Capabilities for Space Appl. 1975 13 p refs (For availability see N75-31129 22-12)

N75-31167 Societe des Accumulateurs Fixes et de Traction, Romainville (France). Section Aerospatiale.
LONG LIFE COMMUNICATION SATELLITES: ELECTRIC POWER SUPPLY DURING THE ECLIPSE PERIOD [SATELLITES DE COMMUNICATION A GRANDE DUREE: FOURNITURE DE L'ENERGIE ELECTRIQUE]
S. Font *In* ESRO European Capabilities for Space Appl. 1975 9 p In FRENCH (For availability see N75-31129 22-12)

N75-31170 Siemens A.G., Munich (West Germany). Tube Div.
HIGH POWER AMPLIFIERS FOR COMMUNICATIONS SATELLITES
Horst Seunik *In* ESRO European Capabilities for Space Appl. 1975 17 p (For availability see N75-31129 22-12)

N75-31171 AEG-Telefunken, Backnang (West Germany).
HIGH POWER TRANSMITTER AMPLIFIERS FOR COMMUNICATION SATELLITES
Jork Bretting and Diederich Koehn *In* ESRO European Capabilities for Space Appl. 1975 14 p (For availability see N75-31129 22-12)

N75-31172 Valvo G.m.b.H., Hamburg (West Germany).
HIGH POWER KLYSTRON AMPLIFIERS FOR COMMUNICATION SATELLITES
Enzio Demmel *In* ESRO European Capabilities for Space Appl. 1975 15 p refs (For availability see N75-31129 22-12)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-31218*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PROCESSING OF COMBINED DOMESTIC BATH AND LAUNDRY WASTE WATERS FOR REUSE AS COMMODE FLUSHING WATER
Warren D. Hypes, Carmen E. Batten, and Judd R. Wilkins Washington Oct. 1975 66 p refs
(NASA-TN-D-7937; L-10034) Avail: NTIS HC $4.25 CSCL 06I

An experimental investigation of processes and system configurations for reclaiming combined bath and laundry waste waters for reuse as commode flush water was conducted. A 90-min recycle flow was effective in removing particulates and in improving other physical characteristics to the extent that the filtered water was subjectively acceptable for reuse. The addition of a charcoal filter resulted in noticeable improvements in color, turbidity, and suds elimination. Heating and chlorination of the waste waters were investigated for reducing total organism counts and eliminating coliform organisms. A temperature of 335.9 K (145 F) for 30 min and chlorine concentrations of 20 mg/l in the collection tank followed by 10 mg/l in the storage tank were determined to be adequate for this purpose. Water volume relationships and energy-use rates for the waste water reuse systems are also discussed. Author

N75-31219# Texas A&M Univ., College Station. Dept. of Chemistry.
ORGANOLANTHANIDES AND ORGANDACTINIDES RELATED TO CATALYSIS Final Scientific Report
Minoru Tsutsui 28 Feb. 1975 30 p refs
(Grant AF-AFOSR-2017-71; AF Proj. 9538)
(AD-A008871; AFOSR-75-0587TR) Avail: NTIS CSCL 07/2

This report deals with a new class of organolanthanide and organoactinide complex, those which contain sigma-bonded ligands. The syntheses and properties are described for these new complexes. The question of f-orbital involvement in the bonding of both lanthanide and actinide complexes is discussed in view of the data which has been obtained thus far. GRA

N75-31220# California Univ., Los Angeles. Dept. of Chemistry.
ISOMERIC (eta5-C5H5)NiB9H9(-) METALLOBORANE ANIONS FROM B9H12(-) AND NICKELOCENE
Richard N. Leyden and M. Frederick Hawthorne 18 Apr. 1975 9 p refs
(Contract N00014-69-A-0200-4019; NR Proj. 053-481)
(AD-A009240; TR-85) Avail: NTIS CSCL 07/3

Reaction of B9H12(-) and Ni(C5H5)2 with Na/Hg produces the metalloborane ((eta5-C5H5)-2-Ni(eta5-B9H9))(-) which is quantitatively converted to a second isomer ((eta5-C5H5)-1-Ni (eta4-B9H9))(-) by thermal isomerization. GRA

N75-31221# Battelle Columbus Labs., Ohio.
EVALUATION OF COMPUTERIZED TECHNIQUES FOR PREDICTING CHEMICAL REACTIVITY AND STABILITY Final Report
C. A. Alexander, J. R. Hoyland, and D. M. Treweek Apr. 1975 74 p refs
(Contract DOT-CG-23223)
(AD-A009561; USCG-D-92-75) Avail: NTIS CSCL 07/1

The purpose of this research project was to evaluate and optimize existing computer programs based on classical thermodynamics in regard to their ability to predict chemical reactivity, stability, and cargo compatibility in ship-board situations where

unusual combinations might exist. Numerous calculated thermodynamic and experimental parameters were evaluated for their ability to predict the stability (self-reactivity) and reactivity (with other chemicals) of chemical substances. Also, thermodynamic prediction of toxic combustion products was accomplished for 20 bulk-transported chemicals under varying conditions. It was concluded that the relationship between the parameters considered and chemical stability and reactivity is too obtuse for conventional statistical analysis. Subsequently, pattern recognition techniques were employed and 11 of the more promising parameters were evaluated. It was concluded that thermodynamic prediction of toxic combustion products offered greater utility in assessing the hazard of burning chemicals than present consensus rating systems (USCG(NAS-NRC) and NFPA), and a few experimental evaluations would be desirable to confirm the validity of the thermodynamic approach. GRA

N75-31222# Stanford Research Inst., Menlo Park, Calif.
SENSITIVITY FUNDAMENTALS Semiannual Technical Progress Report, 1 Jul. - 31 Dec. 1974
D. S. Ross, N. A. Kirshen, and T. Mill 14 Feb. 1975 25 p refs
(Contract N00014-70-C-0190; NR Proj. 122-402; SRI Proj. PRU-8525)
(AD-A009816; SRI-TPL-74-2) Avail: NTIS CSCL 07/3

The effects of static pressures in the kbar range on the thermal decomposition of 2,2-DNP were studied. At 190 deg no significant effect was found of pressure on the rate of decomposition, and the addition of NO2 or O2 similarly had little or no effect. At pressures of 2-3 kbar and at 210 deg, on the other hand, the DNP samples underwent total decomposition, as compared with decomposition in the 10-30 percent range in 210 deg experiments at low (autogenous) pressures. It was concluded that O2 and NO2 play no important role in the autocatalytic decomposition of 2,2-DNP, and, consistent with earlier observations with 1,1-DNP, the application of pressure to these systems at appropriate temperatures bring about exothermic chain decomposition. Thermal decomposition of both 1,1- and 2,2-DNP were followed visually at autogenous pressures in small tubes. NO2 was formed initially in large quantities, and after a still period, the sample tubes burst violently. The times to explosion varied with temperature with slopes similar to those obtained in earlier 10 kbar work; it was concluded that the events were true explosions rather than failure of the tubes.
Author (GRA)

N75-31223# Army Electronics Command, Fort Monmouth, N.J.
THEORETICAL STUDIES ON ION SOLVATION IN NON-AQUEOUS SOLVENTS
Mark Salomon Apr. 1975 38 p refs
(DA Proj. 1T1-61102-A-34A)
(AD-A009502; ECOM-4305) Avail: NTIS CSCL 07/4

Molecular orbital calculations are used to study the nature of ion solvation and solvent structure. Comparing sulfur dioxide (SO2) and tetrahydrothiophene (THT) additions to propionitrile and propylene carbonate, it is found that in SO2 containing solvents, Cl(-) ion solvation is stabilized by coordination to the sulfur by considerable charge transfer to both the S and O atoms. In the THT-Cl(-) complex, charge transfer is not as complete and the S-Cl sigma-bond contains a much larger s-orbital contribution thereby resulting in a much weaker bond. Semiempirical molecular orbital calculations are also reported for methanol chains of up to 6 molecules in length. The theoretical data are in agreement with various experimental spectroscopic and dielectric relaxation data and a mechanism of dipole relaxation based on a dipole-field assisted rotation is suggested. Molecular orbital calculations are reported for ion-solvation in methanol and compared with water solvation. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N75-31224 Purdue Univ., Lafayette, Ind.
OPTIMIZATION OF STRENGTH AND STABILITY OF LAMINATED COMPOSITES Ph.D. Thesis
Ching-Cheng Chao 1974 170 p
Avail: Univ. Microfilms Order No. 75-17169

Basic equations for laminates are given and optimum orientation in laminated composites and shells are discussed relative to combined loads and yield strength. All laminates are assumed to have symmetric angle-ply layups. A modified direct search technique is used to solve the problem of finding the optimum referential yielding load. As opposed to conventional isotropic materials, certain discontinuities are discovered in the optimum fiber directions. Also, some similarities are discovered between the optimum behavior of laminated plates and shells. Under combined loads, a laminate can fail due to structural instability or material yielding. The problem of determining the optimum buckling load on simply supported rectangular laminated plates was also studied. The energy method is employed to overcome the difficulty of finding an approximate solution for the buckling equations. Although the optimum fiber directions are determined independently according to the buckling and the strength constraints, these results can be easily placed in the respective regions where they are meaningful. Dissert. Abstr.

N75-31225# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
FIRE RESISTANCE OF CONCRETE-FILLED STEEL COLUMNS
A. Aulik 1975 18 p refs Transl. into ENGLISH from Byggmesteren (Norway), no. 9, 1973 p 8-12
(NRC/CNR-TT-1806; ISSN-0470-2557) Avail: NTIS HC $3.25

The effect of the concrete filling on the maximum steel temperature was studied for various square profiles influenced by a number of given fire curves. These curves show that the concrete filling considerably diminishes the maximum steel temperatures. The decreasing effect of the concrete filling on the maximum steel temperature increases with increasing aperture factor. At an aperture factor, the difference between an unfilled and filled column is as much as 200 C under certain fire loads. It was also noted that the greater the moisture content, the greater the reduction in steel temperature. Author

N75-31226# Tel-Aviv Univ. (Israel). School of Engineering.
ON WAVE PROPAGATION IN COMPOSITE MATERIALS REINFORCED BY FIBERS WITH CONTINUOUSLY VARYING DIRECTION
Yechiel Weitsman and Yako Benveniste 19 Oct. 1974 31 p refs
(Grant AF-AFOSR-2143-71)
(AD-A008959; TAU-SOE-67/73; SR-4; AFOSR-75-0357TR) Avail: NTIS CSCL 11/4

This paper concerns aspects of wave propagation in composite materials reinforced by fibers whose directions vary continuously in space. Special attention is focused on the case of slight variations in fiber-directions and on plane waves that propagate parallel to the unperturbed direction, a case that can be detailed entirely in analytical expressions. The paper concludes with a solution to a specific example in which we assume that the fiber directions vary linearly from an initial to a final position. A discussion of the specific solution follows. GRA

N75-31227# Duke Univ., Durham, N.C. Dept. of Civil Engineering.
FATIGUE RESISTANCE CRITERIA FOR FIBER REINFORCED COMPOSITE STRUCTURES Final Report, 1 Apr. 1971 - 30 Sep. 1974
George J. Dvorak Oct. 1974 14 p
(Grant DA-ARO(D)-31-124-71-G103)
(AD-A009789; Solid-Mechanics-Ser-12; ARO-9570-6-e) Avail: NTIS CSCL 11/4

The research effort was concentrated on metal matrix composites, such as the Al-B, Al-Be, Cu-W, and similar systems. It was found that in as-fabricated composites with soft matrices fatigue failure can be prevented if the composite shakes down during cyclic loading. The fatigue strength of heat-treated composites is affected by residual microstresses, but failure can be prevented if the total microstresses are kept within the respective fatigue limits (at 10 to the 7th power cycles) of the constituents. These criteria for prevention of fatigue failure in metal matrix composite systems were verified by extensive

comparisons of theoretical predictions with available experimental results. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N75-31228+ Engineering Sciences Data Unit, London (England).
APPROXIMATE DATA ON THE VISCOSITY OF SOME COMMON LIQUIDS
May 1975 34 p refs Amendment A
(ESDU-66024) Avail: NTIS HC $7.50

The variations of viscosity with temperature, at atmospheric or saturation pressure are given for a wide range of liquids. A convenient collection of data is provided for those who do not require a high degree of accuracy. The data are presented in graphs, and an index to the liquids is included. Author

N75-31229 California Inst. of Tech., Pasadena.
ELECTRONIC SPECTROSCOPY BY THE ELECTRON IMPACT METHOD Ph.D. Thesis
Oren Allen Mosher 1975 400 p
Avail: Univ. Microfilms Order No. 75-12517

A variable angle electron-impact spectrometer was rebuilt and used to study electronic excitation spectra in the energy-loss range from 0 eV to beyond 15 eV for 13 molecules. Spectra were obtained in the impact energy range from 20 eV to 70 eV and for scattering angles from 0 deg to 80 deg. The differential scattering cross sections were obtained for several low-lying electronic transitions and used to determine whether a transition was spin-allowed or spin-forbidden. Further assignments of some transitions were made by comparison of the present results with earlier theoretical and experimental studies. Dissert. Abstr.

N75-31230 Purdue Univ., Lafayette, Ind.
ASPECTS OF COMPUTER-ASSISTED GAS CHROMATOGRAPHY Ph.D. Thesis
Richard Bruce Westerberg 1974 196 p
Avail: Univ. Microfilms Order No. 75-17299

A precise computer-controlled gas chromatograph, capable of extended periods of unattended operation, was constructed. This instrument operated isothermally with sample injection and carrier gas flow rate controlled by the computer. Control and measurement of carrier gas flow rate for high-precision gas chromatography are studied. The performance of two computer-controllable flow controllers, and a flow transducer, were evaluated by two methods. Chromatographic behavior of a cholesteryl myristate stationary phase in an electric field is also investigated. This study involved the use of the automated gas chromatographic system. Changes in peak shape which accompany the imposition of an electric field were examined by moments analysis. Dissert. Abstr.

N75-31231 Florida Univ., Gainesville.
HADAMARD TRANSFORM AND PROGRAMED SCAN MULTIELEMENT ANALYSIS - MULTIPLEX VERSUS SINGLE CHANNEL ATOMIC FLUORESCENCE SPECTROMETRY Ph.D. Thesis
Francis William Plankey, Jr. 1974 112 p
Avail: Univ. Microfilms Order No. 75-16434

The practice of sequential analysis for many trace elements by flame spectrometry was explained and techniques for rapid sequential and simultaneous multielement analysis were reviewed. A description of, and justification for using a xenon arc continuum source and an argon separated air/acetylene flame for multielement analysis were discussed. Multiplex spectrometry was explained and types of multiplex methods for simultaneously coding many spectral intervals at a detector were covered. Of the three multiplexing techniques, Fourier transform, frequency correlation, and Hadamard transform, only the latter was chosen for implementation. Signal-to-noise relationships were investigated for the multiplex and the single channel cases, and example calculations were shown. The construction and operation of a computer controlled single channel scanning spectrometer (SCSS) was described, and the results for the analysis of a number of elements were presented. Dissert. Abstr.

N75-31232 Purdue Univ., Lafayette, Ind.
INVESTIGATION OF A THERMAL EXHAUST MANIFOLD REACTOR USING AN ARTIFICIALLY GENERATED EXHAUST Ph.D. Thesis
Bruce William Gerhold 1974 128 p
Avail: Univ. Microfilms Order No. 75-17202

The limit of self ignition of gas mixtures with a composition and temperature representative of that in a thermal exhaust manifold reactor was measured, and these data were interpreted to formulate new design concepts which will aid in leaner spark ignition engine and reactor operation. An analysis of the ignition, using an established ignition theory, has indicated that it is a thermal as opposed to chain ignition and has provided the functional form of the heat release rate. The effects (upon the ignition limit) of gas composition, temperature, and reactor volume were investigated experimentally via a steady flow simulation of an engine exhaust that has facilitated independent changes in the gas composition and temperature. These results have demonstrated that hydrogen must be present for the mixture to ignite, which precludes the use of thermal reactors on fuel lean engines, and a near optimum amount of secondary air addition was defined to promote ignition and warm-up of a practical system. Dissert. Abstr.

N75-31233# Lockheed Missiles and Space Co., Palo Alto, Calif.
ATTEMPT AT AN EXPERIMENTAL DISCLOSURE OF CHAINS OF EVOLUTIONARY CHANGES IN HOMOGENEOUS CATALYTIC SYSTEMS OF HYDROGEN PEROXIDE DECOMPOSITION
Iu. I. Matatov and A. P. Rudenko [1975] 5 p refs Transl. into ENGLISH from Vestn. Moscow Univ., Khimiia (USSR), no. 2, 1975 p 214-218
Avail: NTIS HC $3.25; National Translation Center, John Crerar Library Chicago, Illinois 60616

Results were obtained which show that chains of possible evolutionary changes in open catalytic systems (predicted by the theory of self-development) are disclosed by conducting tests to determine the general catalytic activity of systems. The hydrogen peroxide decomposition was used as the basic reaction. M.J.S.

N75-31234# Cranfield Inst. of Technology (England). School of Mechanical Engineering.
AIDED SUPERSONIC COMBUSTION OF TRANSVERSELY INJECTED FUELS
R. A. Cookson and J. J. Isaac 3 Mar. 1975 34 p refs Backup document for AIAA Synoptic scheduled for publication in the AIAA Journal, Dec. 1975
(Grant AF-AFOSR-72-2321)
Avail: NTIS HC $3.75

An investigation was made of the sustained combustion of transversely injected fuel jets in an enclosed Mach 2 air-stream. Hydrogen, methane, and kerosene were employed as fuels. High-enthalpy test-air was supplied from a pebble-bed regenerative heat exchanger through a Mach 2 two-dimensional nozzle at a free-stream static pressure of 101.3 kN/cu cm. The stagnation temperature of the test-air could be varied within wide limits, but for the studies reported here, had a maximum value of about 1800 K. It was found that hydrogen would ignite and burn easily under the above conditions, but that some ignition aid was required if methane or kerosene was to be combusted under similar conditions. Sustained combustion of either methane or kerosene was achieved by adding a small quantity of hydrogen to the main stream. The favorable flame stabilization effect of the obstruction caused by a fuel jet injected transversely into the supersonic stream was demonstrated. Author

N75-31235# European Space Research Organization, Paris (France).
SEPARATION OF NITROGEN AND OXYGEN IN LAMINAR HYPERSONIC BOUNDARY LAYERS AT THERMOCHEMICAL EQUILIBRIUM OF AIR

Heinrich Eickhoff and Frank Thiele Mar. 1975 33 p refs Transl. into ENGLISH of "Entmischung von Stickstoff u. Sauerstoff in laminaren Hyperschallgrenzschichten bei lokalem thermochemischen Gleichgewicht der Luft", Tech. Univ. Berlin Report DLR-FB-74-63, 20 Aug. 1974 Original German report available from DFVLR, Porz, West Ger. 15.30 DM
(ESRO-TT-154; DLR-FB-74-63) Avail: NTIS HC $3.75

The hydrodynamic equations of balance are discussed for the model of dissociated air with the five components N2, O2, NO, N, and O regarding a balance equation for the concentration of an element. The boundary layer equations and their similar solutions are given. The numerical solution yields a maximum deviation of the concentration of the element oxygen in the boundary layer of about 20%. It follows from the present results that a calculation of hypersonic boundary layers in thermochemical equilibrium with an accuracy corresponding to that of the five component model of air requires a balance equation for the concentration of an element besides the balance equations for momentum and energy. Author (ESRO)

N75-31236# GTE Labs., Inc., Waltham, Mass.
HIGH FIELD CONDUCTION AND BREAKDOWN IN LIQUID SULFUR
J. M. Proud and J. J. Auborn Mar. 1975 11 p refs
(Contract N00014-74-C-0215; NR Proj. 359-570)
(AD-A009254; TR-1) Avail: NTIS CSCL 07/4

The absence of C-H bonds in aprotic and particularly in molecular liquids possessing a wide liquid range enhances the probability of observing alpha-processes in these liquids. Evidence for electron multiplication and breakdown in the liquid phase of sulfur is presented. Current-voltage non-linearities and the bubble-free development of electrical discharges are observed. GRA

N75-31237# Illinois Univ., Urbana. Dept. of Chemistry.
DETERMINATION OF KINETIC PARAMETERS BY THE FREQUENCY DEPENDENCE OF THE NMR COALESCENCE TEMPERATURE
H. S. Gutowsky and H. Cheng Apr. 1975 12 p refs
(Contract N00014-75-C-0163; NR Proj. 056-547)
(AD-A009888; TR-6) Avail: NTIS CSCL 07/4

A method is described in which one determines the rate parameters for chemical exchange between two equally populated uncoupled sites by measuring the dependence upon NMR resonance frequency of the temperature at which the corresponding two high-resolution lines coalesce. The method is relatively simple and, when applicable, gives good accuracy with modest effort. It was tested by observing the coalescence of the methyl group resonances due to internal rotation in neat dimethylformamide, -acetamide and -propionamide, at 60,100 and 220 MHz. The results include an entropy of activation for the three compounds, and an enthalpy. GRA

N75-31238# Arizona Univ., Tucson. Dept. of Chemistry.
CHROMATOGRAPHIC CHARACTERIZATION OF POROUS POLYMERS FOR USE AS ADSORBENTS IN SAMPLING COLUMNS Technical Report, Jan. 1974 - May 1975
L. D. Butler and M. F. Burke 13 May 1975 32 p refs
(Contract N00014-75-C-0512; NR Proj. 051-518)
(AD-A009889; TR-5) Avail: NTIS CSCL 07/4

A systematic approach for the use of elution chromatography measurements in characterizing polymeric adsorbents is described. A variety of commercially available porous polymeric adsorbents has been evaluated with regard to the chromatographic capacities and efficiencies of the polymers for several organic adsorbates. The results of this work are discussed in terms of a wide range of sampling situations as well as those specific systems which have been investigated. GRA

N75-31239# Army Foreign Science and Technology Center, Charlottesville, Va.
EXPERIMENTAL METHODS OF DETERMINING THE RADIOLYSIS PRODUCTS OF ALKALI METAL AZIDES
E. P. Abakumov and Yu. A. Zakharov 10 Jan. 1974 8 p refs Transl. into ENGLISH from Politekhnicheskii Inst., Tomsk. : Izv. (USSR), no. 199, 1969 p 56-60
(AD-A009466; FSTC-HT-23-917-73) Avail: NTIS CSCL 07/5

Methods of determining all radiolysis products in sodium azide crystals irradiated with X-ray and photon radiations are presented. First the nitrogen evolved from the crystal was determined; next, the nitrogen trapped by the azide matrix in dissolution; and then the remaining products (OH(-) and NH3) and the undecomposed azide group. GRA

N75-31240# California Univ., Irvine. Dept. of Chemistry.
SINGLE VIBRONIC LEVEL PHOTOCHEMISTRY OF FORMALDEHYDE H2CO SINGLET A2. PART 1: RADIATIVE AND NON-RADIATIVE TRANSITIONS Final Report, 1 Apr. 1974 - 31 Mar. 1975
Richard G. Miller and Edward K. C. Lee 25 Apr. 1975 15 p refs
(Contract N00014-69-A-0200-9005; NR Proj. 014-506)
(AD-A009401; A-7) Avail: NTIS CSCL 07/4

Fluorescence decay times and fluorescence emission quantum yields from various single vibronic levels of the first excited singlet state of H2CO (singlet A2) have been measured. Radiative and non-radiative lifetimes of the single vibronic levels have been determined. The stronger promoting vibrational mode for the radiative transition is the asymmetric stretch mode rather than the out-of-plane bending mode. The latter mode, however, is a promoting mode for the non-radiative transition. As much as a factor of 40 variation in the radiative lifetime values is observed for the variety of vibrational states studied. GRA

N75-31241# Naval Air Development Center, Warminster, Pa. Vehicle Technology Dept.
CHARACTERIZATION OF HYDRAULIC FLUIDS, NADRAUL MS-5 AND MIL-H-5606
L. C. Fuller, G. Hargreaves, and E. R. Wright 1 Apr. 1975 35 p refs
(AD-A009353; NADC-74237-30) Avail: NTIS CSCL 07/3

A currently used hydraulic fluid (MIL-H-5606), a new fire resistant hydraulic fluid (MS-5), and components of both fluids were characterized. The molecular structures of the fluid components were elucidated by infrared and nuclear magnetic resonance spectroscopy. The thermal stabilities of the fluids and their components were studied over the expected temperature range of service use by differential thermal analysis and thermogravimetric analysis. GRA

N75-31242# State Univ. of New York, Buffalo. Dept. of Chemistry.
THE INVESTIGATION OF PROPANE OXIDATION USING ELECTRO CHEMICAL MASS SPECTROMETRY Semiannual Report, Jul. - Dec. 1974
T. M. Riedhammer and Stanley Bruckenstein Dec. 1974 64 p refs
(Contract DAAK02-71-C-0306; DA Proj. 1T0-61102-A-34A)
(AD-A009585; SAR-7) Avail: NTIS CSCL 07/4

An EMS study of the adsorbable and electrooxidizable impurities in our electrochemical system was undertaken. The source of most of the impurities was found and corrected. The adsorbtion and oxidative desorbtion of methylcyclohexane and isobutane was studied. Steady state and time dependent results are presented. A new digital data acquisition and experimental control system was developed and interfaced to the EMS system. This system made possible the acquisition of much more useful data from a single experiment rather than depending upon very high reproducibility between experiments. GRA

N75-31243# Naval Weapons Center, China Lake, Calif.
PHYSICOCHEMICAL DETAILS AT THE SURFACE OF BURNING ILLUMINATION FLARES Technical Report, 1 Jul. 1973 - 31 Dec. 1974
J. L. Eisel and D. E. Zurn Apr. 1975 20 p refs
(AD-A009356; NWC-TP-5726) Avail: NTIS CSCL 21/2

The surface processes during the combustion of magnesium/sodium nitrate/binder illumination flares were observed using color cinephotomicrography. Examination of the films led to several conclusions relative to the physicochemical details of pyrotechnic combustion of a limited class of materials. In binder-containing flares the surface temperature is inferred at between 380 C and 651 C. The major means of removal of magnesium from the surface is expulsion in the condensed phase as a result of local overpressure due to interfacial oxidation and subsequent

gasification of mul molten binder. The effect on intensity, efficiency, and burning rate of magnesium particle size and content was examined, as well as of binder type and content. When little or no binder is present completely different processes dominate and surface temperatures are higher. GRA

N75-31244# Bureau of Mines, Pittsburgh, Pa. Energy Research Center.
TUBE-WALL METHANATION REACTORS WITH COMBINED DIFFUSION AND KINETIC RESISTANCE
T. D. Ralston, W. P. Haynes, J. A. Forney, and R. R. Schehl Dec. 1974 20 p refs Previously announced as N74-28653 (PB-241881/2; BM-RI-7941; N74-28653) Avail: NTIS HC $3.25 CSCL 07D

A mathematical model is presented for heterogeneously catalyzed chemical reactors operating under turbulent conditions. The model includes reaction kinetics on the catalyst surface as well as diffusion of the reacting components within the reactor. Three applications of the model to tube-wall methanation reactors are discussed. The first application is a computation of catalyst activity from measured reactor data. This result is then used in a reactor sizing problem and a problem of reactor simulation with recycle. In addition to the reactor model, a novel approach to solving the recycled reactor problem is given. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N75-31245 Denver Univ., Colo.
DEVELOPMENT OF THE ROTATING ELECTRODE APPARATUS AND ITS APPLICATIONS TO PITTING CORROSION STUDY IN AUSTENITIC STAINLESS STEELS Ph.D. Thesis
Kirit J. Bhansali 1974 125 p
Avail: Univ. Microfilms Order No. 74-24653

A device was built that permits the detection and location of the local potential fields set up by local action currents in the solution adjacent to a corroding metal surface. These potentials are measured and correlated to the local action current for developing pits on type 304 stainless steel samples anodically polarized to the pitting range in 2% NaCl solutions. This correlation was obtained by integrating the peak potentials with time and plotting the integrated values against corresponding pit volume. A linear correlation was obtained over a range where pits were small enough that no secondary pits were observed in the vicinity. Dissert. Abstr.

N75-31246 Texas Univ., Austin.
THERMOMIGRATION IN ALUMINUM Ph.D. Thesis
Rodney Allen Mckee 1975 82 p
Avail: Univ. Microfilms Order No. 75-16709

The observed grain or crystal size effect on the measured heat of transport for vacancy migration in the force of a temperature gradient is characterized. This crystal size effect was first observed and reported by studying self-thermomigration in aluminum by marker-shift experiments on large single crystals and similar geometry polycrystalline aggregates. It was found that the measured heat of transport could be positive or negative depending on crystal size. Deviations from local equilibrium in the vacancy concentrations of large single crystals as a possible explanation are suggested for the data. The effect of the vacancy migration on the measured heat of transport for dilute silver-aluminum alloys and the diffusivity of silver in single crystals of pure aluminum in a temperature gradient was measured. Both experiments yield results that support the proposed explanation of excess vacancy concentrations in large single crystals. Dissert. Abstr.

N75-31247 Pittsburgh Univ., Pa.
TUNNELLING DETERMINED SUPERCONDUCTING ENERGY GAP OF BULK SINGLE CRYSTAL ALUMINUM Ph.D. Thesis
Robert L. Civiak 1974 86 p
Avail: Univ. Microfilms Order No. 75-18231

A procedure was developed for fabricating Giaver tunnel junctions on bulk aluminum. Al-I-Ag junctions were prepared, where I is the naturally formed oxide on the polished, chemically treated aluminum surface. The aluminum energy gap was determined from tunneling conductance curves obtained from samples oriented in three different crystal directions, and as a function of magnetic field in each of these orientations. In contrast to the results of microwave absorption measurements on superconducting aluminum, no magnetic field dependence could be measured for either the average gap or the spread in gap values of the tunnelling electrons. This is consistent with commonly accepted tunnelling selection rules, and Garfunkel's interpretation of the microwave behavior which depended upon adjusting the energy spectrum of only the electrons travelling parallel to the surface in the presence of a magnetic field. Dissert. Abstr.

N75-31248*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.
THE EFFECT OF MICROSTRUCTURE AND STRENGTH ON THE FRACTURE TOUGHNESS OF AN 18 Ni, 300 GRADE MARAGING STEEL
J. A. Psioda and J. R. Low, Jr. Aug. 1975 92 p refs
(Grant NGR-39-087-003)
(NASA-CR-143501; TR-7) Avail: NTIS HC $4.75 CSCL 11F

A 300 grade maraging steel was chosen as a vehicle by which to understand the inverse relationship between strength and toughness in high strength alloys such as the 18 Ni maraging steels. The 18 Ni, 300 grade maraging material was a commercial grade consumable-electrode, vacuum arc remelted heat obtained in the form of forged and annealed plate. The matrix contained a population of second-phase impurity inclusions which was a product of the casting and hot working processes. These inclusions did not change with subsequent precipitation hardening. Changes in microstructure resulting in strength increases were brought about by variations in aging temperature and time. Maximum strength was attained in the 300 grade maraging steel by aging at 427 C (800 F) for 100 hours. Tensile, fatigue precracked Charpy impact, and plane-strain fracture toughness tests were performed at room temperature, 20 C (68 F). With increasing strength the fracture toughness decreases as smaller and smaller inclusions act as sites for void initiation. Author

N75-31249# Lockheed-California Co., Burbank. Fatigue and Fracture Mechanics Lab.
EFFECT OF SPECTRUM LOADS AND CORROSIVE ENVIRONMENTS ON FATIGUE CRACK PROPAGATION IN TITANIUM
Jun. 1975 32 p refs
(LR-27034) Avail: NTIS HC $3.75

A test program was conducted on Ti-6Al-4V(RA) titanium alloy to investigate the effects of spectrum loads on crack growth under various environmental and loading conditions. The basic spectrum used simulated the loads encountered in the wing pivot area of the B-1 bomber. Test results are presented showing the effects of compressive load truncation. Cracks were propagated from corner cracks at open and filled fastener holes, and both snug and interference fit fasteners were evaluated. Environments included high humidity air, salt water and dry air. Flaw shape effects on crack growth rate are presented for $a/2c = 0.3$ and 0.5. Results indicate that (1) compressive loads tend to wipe out retardation produced by tensile overloads; (2) corner cracked holes with interference fit fasteners have considerably longer lives than snug fit fasteners, and both are better than an open hole with the same flaw size; and (3) Ti-6Al-4V(RA) is highly sensitive to corrosive environments. Author

N75-31250# Lockheed Missiles and Space Co., Palo Alto, Calif.
INVESTIGATION OF THE LIGHT EROSION OF METALS IN FLUIDS
V. A. Ageev 1975 5 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii, Akad. Nauk Belorussk. SSR (Minsk), v. 23, no. 1, 1975 p 42-46
Avail: NTIS HC $3.25; National Translation Center, John Crerar Library, Chicago, Ill. 60616

In order to refine the mechanism of metal erosion under the effect of laser radiation, the damage which occurs in metals as the external medium changes was studied. Knowledge of the mechanism of the inflow of light erosion products into a plasma

permits the application of lasers in emission atomic spectrum analysis. Experimental results of metal rupture by laser radiation in air and fluids are presented and discussed. Author

N75-31251# Stanford Research Inst., Menlo Park, Calif.
MODELS FOR DUCTILE AND BRITTLE FRACTURE FOR TWO DIMENSIONAL WAVE PROPAGATION CALCULATIONS Final Report, 20 Jun. 1972 - 19 Feb. 1974
L. Seaman and D. A. Shockey Feb. 1975 140 p refs
(Contract DAAG46-72-C-0182; DA Proj. 1T0-62105-AH-84; SRI Proj. PYU-2024)
(AD-A008992; AMMRC-CTR-75-2) Avail: NTIS CSCL 11/6

Two-dimensional computational subroutines were constructed to simulate ductile and brittle fracture in Lagrangian wave propagation computer programs applied to armor penetration problems. Included in these subroutines are models of void or crack nucleation and growth, and the stress and strength reduction associated with developing damage. These models extended the earlier one-dimensional models to multidimensional problems, higher shear strain cases, and higher damage levels (including full separation in the ductile model). Two-dimensional wave propagation test calculations were made with the ductile and brittle fracture models to simulate impacts in targets of 1145 aluminum, Armco iron, and XAR30 armor steel. The fracture models were found to function satisfactorily. It is concluded that the fracture models for both ductile and brittle fracture modes are operable and are suitable for insertion as subroutines into Lagrangian wave propagation codes such as HEMP. GRA

N75-31252# Army Materiel Command, Texarkana, Tex. Intern Training Center.
FERROUS POWDER METAL PREFORM FORGING METHODS Final Report
Mark Albert Perlman Apr. 1975 73 p refs
(AD-A009311; USAMC-ITC-02-08-75-213) Avail: NTIS CSCL 18/8

The research is designed to examine the three ferrous powder metal preform forging methods currently under consideration by the U.S. Army. The examination will answer the following question: which method is best for a particular complexity of parts. One of the major conclusions drawn from all three methods, which is of particular interest to the engineer, is that the reduction in cost of forging using the powder metal preforms was about 50 percent less than conventional methods of forging the same parts. Cost reduction was achieved by elimination of much of the final finished machining necessary in fabrication of the part. GRA

N75-31253# Battelle Columbus Labs., Ohio.
PHASE STABILITY AND SOLUTION STRENGTHENING IN TITANIUM ALLOYS Final Scientific Report, 1 May 1971 - 31 Dec. 1974
E. W. Collings 25 Feb. 1975 62 p refs
(Grant AF-AFOSR-2084-71)
(AD-A009160; AFOSR-75-0594TR) Avail: NTIS CSCL 11/6

The program had to do with effects resulting from the addition of transition elements to titanium; while subsequent phases involved alloying with B-metals, or nontransition metals and the so-called interstitial elements. Alloying of titanium with transition metals and B-metals leads to two distinctly different classes of behavior. The alloying of titanium with a transition element results, to a first approximation, in the creation of a new transition metal with an increased electron/atom ratio. The principal effect of the alloying of titanium (Ti) with another transition element (T2) is the increasing tendency for the room-temperature-stable quenched crystal structure to be bcc as the solute concentration is increased. The omega-phase is a precipitate which tends to be embrittling. Conclusions regarding the physical properties of an omega-phase alloy structure were based on a detailed analysis of the magnetic and superconductive properties of an aged-to-metastabl3-equilibrium Ti-Mo (10 at .%) alloy. The authors also conducted investigations of the Ti-Nb, Ti-Fe, Ti-Mn, Ti-V and Ti-V-Al alloy systems. GRA

N75-31254# Army Materiel Command, Texarkana, Tex. Intern Training Center.
INFLUENCE OF OXIDATION UPON THE KAISER EFFECT OF ACOUSTIC EMISSION Final Report
Thomas G. Cochran Apr. 1975 46 p refs
(AD-A009283; USAMC-ITC-02-08-75-112) Avail: NTIS CSCL 11/6

The objective of this research was to examine acoustic emission during reload of steel specimens. In particular, the role of oxidation upon acoustic emission during reload was investigated. Sixteen samples of AISI 1020 steel were loaded to 3100 pounds. Acoustic emission signals were recorded during loading. Then samples were divided into two groups and one of these groups immersed in Sears SAE 10-40 motor oil to retard oxidation. After two weeks, all specimens were reloaded. The tests were again monitored for acoustic emission. Conclusions indicate there is a significant decrease in acoustic emission during reload. There was no significant difference in acoustic emission from the two groups during reload indicating no effect of oxidation on acoustic emission. GRA

N75-31255# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.
ACTIVATION ENERGY OF SELF DIFFUSION AND THE MELTING TEMPERATURE OF METAL
V. I. Meskov 1974 10 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii. Chernaya Metallurgiya (USSR), no. 5, 1960 p 93-98 Sponsored in part by NSF
(TT-74-58022) Avail: NTIS HC $3.25 CSCL 11F

The self-diffusion coefficients of more than a dozen pure metals are extracted from the literature and the activation energies for their diffusion related to respective melting points. GRA

N75-31256# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.
THE EFFECT OF SILICON, IRON, AND BERYLLIUM ON THE RATE OF DIFFUSION OF IRON IN ALUMINIUM
A. P. Smiryagin and O. S. Kvurt 1974 24 p refs Transl. into ENGLISH from Gos. Nauchno-Issed. i Proektn. Inst. Splavov i Obrabotki Tsvetn. Metallov (USSR), no. 16, 1957 p 90-115 Sponsored in part by NSF
(TT-74-58007; DMDC-14036) Avail: NTIS HC $3.25 CSCL 11F

The tracer diffusion coefficient of Fe-59 in pure Al and binary Al alloys containing Si(0.57 to 11.54 percent), Fe(0.58 to 4.67 percent), or Be(0.25 to 1.5 percent) was determined in the temperature range 500 to 600C. Similar experiments were performed with ternary Al alloys containing Si(0.55 to 1.87 percent) and Fe(0.58 to 0.60 percent). Interdiffusion experiments were performed with pure Fe and Al and Fe with Al alloys containing Si, Be, and Fe at temperatures of 400 to 600C and then examined metallographically. GRA

N75-31257# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.
X-RAY STUDY OF DIFFUSION OF METALS IN THIN DOUBLE LAYERS
M. A. Levitskaya and R. L. Fogelson 1974 9 p refs Transl. into ENGLISH from Izv. Vysshikh Ucheb. Zavedenii. Chernaya Metallurgiya (USSR), v. 3, 1960 p 117-121 Sponsored in part by NSF
(TT-74-58003; DMDC-13664) Avail: NTIS HC $3.25 CSCL 11F

An X-ray technique is described for determining the interdiffusion coefficient when two thin metal films are diffused for very short annealing times. The technique was applied for the Cu-Ni, Cu-Ag, and Cu-Zn system. Temperatures of diffusion ranged from 350 to 90C. Arrhenius expressions were determined for all three alloy systems. These data are compared with data taken from more traditional experimental techniques and considerable differences are noted in values. GRA

N75-31258# Battelle Columbus Labs., Ohio. Metal Science Section.
THE INFLUENCE OF SUBSTANCE ON THE PROPERTIES OF METALS Final Technical Report, 1 Jun. 1971 - 31 May 1974
A. H. Clauer and B. A. Wilcox May 1975 127 p refs
(Contract F33615-71-C-1714; AF Proj. 7021)
(AD-A009957; ARL-75-0113) Avail: NTIS CSCL 11/6

There have been numerous studies concerned with thermo-

mechanical processing (TMP) of 7000 series (Al-Zn-Mg-Cu) and 2000 series (Al-Cu-Mg) aluminum alloys. The ultimate goal of these studies has been to develop the ability to tailor a material's microstructural characteristic through TMP and composition control to improve a variety of properties. In this investigation the influence of TMP on several commercial alloys and compositional modifications based on them has been studied relative to their resulting tensile and creep properties. The benefits of TMP for high-temperature strength must be gained by creating a strong microstructure that is stable during long exposure to elevated temperatures under stress. The elements of the microstructure subject to modification are the grain size and shape, the precipitate composition, morphology and distribution, and the dislocation substructure. GRA

N75-31259# National Bureau of Standards, Washington, D.C. Metallurgy Div.

APPLICATION OF ION BEAM MILLING TO THE CHARACTERIZATION OF CRACKS IN METALS

L. K. Ives, A. Harper, and A. W. Ruff Apr. 1975 30 p refs (COM-75-10634/4; NBS-TN-862) Avail: NTIS HC $3.75 CSCL 11F

The technique of ion beam milling coupled with subsequent optical and scanning electron microscopy was applied as a means of detecting and characterizing small surface intersecting cracks. Two types of cracked specimens involving different metals were studied. Various orientations of the crack plane, crack direction, and ion beam were explored. The technique is capable of increasing the sensitivity for detection of small cracks and also removing distorted surface layers and revealing the crack more accurately. GRA

N75-31260# Del Research Corp., Hellertown, Pa.

SIZE REQUIREMENTS FOR FATIGUE-CRACKED FRACTURE TOUGHNESS SCREENING SPECIMENS Final Report, Aug. 1973 - Dec. 1974

J. Keith Donald and John L. Shannon, Jr. Dec. 1974 76 p refs Prepared for Metal Properties Inc., Hellertown, Pa.
(Contract DAAG46-74-C-0004)
(AD-A009525; AMMRC-CTR-74-72) Avail: NTIS CSCL 11/6

Aluminum, titanium and steel alloys were selected on the basis of their strength/toughness properties for the purpose of investigating the performance of a proposed fatigue-cracked fracture toughness screening specimen. Specimens of varying thicknesses and widths were tested with the largest specimen of each alloy satisfying the minimum size requirements according to ASTM-E-399-74 specifications. The results of this program demonstrate the feasibility of the proposed specimen configuration with lowest width to thickness ratio showing the best correlation between the net-fracture strength and plane strain fracture toughness K sub I sub C. Further investigation is warranted to assess the effects of specimen eccentricity and other limitations related to relative toughness of the material. GRA

N75-31261# Georgetown Univ., Washington, D.C. Dept. of Chemistry.

REACTIVITY PATTERNS OF LIGHTER METALLIC ELEMENTS (TITANIUM) Final Report, 1 May 1971 - 31 Dec. 1974

Joseph E. Earley Mar. 1975 7 p
(Grant AF-AFOSR-2003-71)
(AD-A009650; AFOSR-75-0520TR) Avail: NTIS CSCL 07/2

The report summarizes research concerning the reactivity patterns of titanium species in aqueous media. Redox and charge transfer reactions and mechanisms are discussed. Publications are listed. GRA

N75-31262# Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.

FILM BREAKDOWN AND PITTING Final Report, 1 Sep. 1971 - 31 Dec. 1974

M. Metzger 21 Apr. 1975 7 p refs
(Grant DA-ARO(D)-31-124-72-G28; DA Proj. 200-61102-B-32D)
(AD-A009788; ARO-5063.10-MC) Avail: NTIS CSCL 11/6

Aluminum was studied in sulfuric acid, with chloride to 0.1M, by electron microscopy, polarization and gravimetric methods. Film breakdown and transient pitting occurred in the absence of chloride. Chloride was not found to alter the film; its role was to stabilize pit embryo growth. Stable pit nucleation was conceived as requiring a pit embryo persistent enough to produce sufficient chloride enrichment within the pit. The observed absence of a sharp potential threshold for pit nucleation at low chloride levels was consistent with these views. GRA

N75-31263# Georgia Inst. of Tech., Atlanta. School of Chemical Engineering.

DEFORMATION BEHAVIOR IN QUENCHED AND AGED BETA TITANIUM ALLOYS

H. G. Paris, B. G. LeFevre, and E. A. Starke, Jr. 28 Apr. 1975 22 p refs
(Contract N00014-75-C-0349; CNR Proj. 031-750)
(AD-A009892; TR-75-1) Avail: NTIS CSCL 11/6

The deformation characteristics of quenched and aged Ti-V alloys in the composition range 20 to 40% V have been examined by optical metallography and transmission electron microscopy. A coarse lenticular deformation product similar in appearance to previously reported strain induced martensites was found to be associated with the occurrence of the omega phase. These features proved to be (112) -111= twins. Continued aging of the omega containing alloys resulted in a transition of the deformation mode from twinning to slip at a point which corresponded to the onset of embrittlement or alpha precipitation at the omega-beta interfaces. The formation of deformation twins in a two-phase omega-beta structure is discussed in terms of possible mechanisms. GRA

N75-31264# Bureau of Mines, Reno, Nev. Metallurgy Research Center.

ELECTROCHEMICAL KINETICS OF THE REACTION OF TITANIUM METAL WITH TITANIUM SUBCHLORIDES IN MOLTEN SODIUM CHLORIDE

D. J. MacDonald, A. E. Raddatz, T. A. Henrie, and E. K. Kleespies Dec. 1974 21 p refs Previously announced as N74-28657 (PB-241879/6; BM-RI-7919; N74-28657) Avail: NTIS HC $3.25 CSCL 07D

Rates of electrooxidation and electrodeposition of titanium metal in a bath of molten sodium chloride containing dissolved TiCl2 and TiCl3 were measured as a function of current density, temperature, and TiCl2 and TiCl3 concentrations. A rate equation which adequately describes the anodic electrooxidation at a single temperature (860C) is presented. The cathodic deposition of titanium at 860C is also described. The average number of electrons transferred per titanium atom dissolved anodically ranged from 0.84 to 2.7, the exact number being a function of current density and of TiCl2 and TiCl3 concentrations. In the cathodic experiments, from 2.6 to 6.3 electrons were transferred per titanium atom deposited, and the ratio was found to be a function only of TiCl3 concentration. GRA

N75-31265# Battelle Columbus Labs., Ohio. Metals and Ceramics Information Center.

HANDBOOK OF SOVIET ALLOY COMPOSITIONS

Marshall J. Wahll and Roy F. Frontani Feb. 1975 322 p refs
(Contract DSA900-75-C-1803)
(AD-A009118; MCIC-HB-05) Avail: NTIS CSCL 11/6

The overall objective of the Handbook of Soviet Alloys is to provide technical research people, i.e., engineers, metallurgists and others, a key to quickly establish the chemical composition of a wide variety of metals and alloys used in the U.S.S.R. Recent alloys as well as earlier developed alloys are included in the Handbook as the user may encounter both new and old alloy designations in reviewing the literature. Data on compositions, designations, and other miscellaneous information are compiled in 25 tables. An index (INDEX OF ALLOYS) which lists the location within the various tables of specific alloys and metals by their alphabetical numerical designation, is provided to aid in the use of the Handbook. The tables and index of alloys were computer generated. A general discussion of the Soviet system of designation of metals and alloys is presented. A discussion of the specific designations used is given in the introductory discussion preceeding each table. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-31266# Defence Research Information Centre, Orpington (England).
THE WEATHERING OF PLASTICS MATERIALS IN THE TROPICS. PART 2: POLYACETALS
1974 59 p refs Prepared jointly with Brit. Plastics Federation
(BR41853; S/T-Memo-6-74-Pt-2) Avail: NTIS HC $4.25

Two polyacetal materials, an end-capped homopolymer and a copolymer, both with and without carbon black, were exposed to outdoor weathering for periods of up to 4 years, at three tropical sites in Australia and one temperate site in the UK. Dimensional, weight, and visual changes and certain mechanical properties were monitored in order to follow changes due to weathering. In addition, a supplementary laboratory aging program on the materials was undertaken. The notched tensile test was a sensitive index of degradation in polyacetals. As for many other materials, the weathering of polyacetals appears to be sensitive to moulding conditions. Results show that both homopolymer and copolymer polyacetals containing 0.5% carbon black can be suitable materials for unrestricted outdoor applications. In contrast, the natural polymers are not suitable for more than short periods of continuous outdoor exposure in either temperate or tropical conditions. Their surface changes are in general reflected in a dramatic loss in toughness, though, their rigidity is not generally affected. This suggests the occurrence of degradation processes in addition to photooxidation. The copolymer has a reasonable life when stored under very hot conditions, and is more resistant to hot storage under humid conditions than the homopolymer. The inclusion of carbon black gives no protection under these circumstances. Author (ESRO)

N75-31267# Radio Corp. of America, Cape Kennedy, Fla.
A METHOD OF PROCESS TEMPERATURE MONITORING FOR DIELECTRIC HEAT-SEALING OF STRUCTURAL FABRICS
E. L. Crosby, Jr. 15 Apr. 1974 13 p
(Contract F08606-74-C-0025)
(AD-A008653; RCA/TELTA-TR-74-056; AFETR-TR-75-21) Avail: NTIS CSCL 11/1

In dielectric heat-sealing of synthetic materials the peak temperature must be kept below some critical value, depending on the fiber composition, in order to prevent destructive overheating. Continuous seal temperature monitoring has not heretofore been possible, and trouble has been experienced with excess heat. By the use of temperature indicative coating, striped on the material, an objective and accurate seam quality assurance technique has been developed. It is described in detail and its advantages are discussed. GRA

N75-31268# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
STRUCTURE-STABILITY RELATIONSHIPS OF POLYMERS BASED ON THERMOGRAVIMETRIC ANALYSIS DATA. PART 2: POLYHETEROCYCLICS
Gerhard F. L. Ehlers Dec. 1974 77 p refs
(AF Proj. 7340)
(AD-A008780; AFML-TR-74-117-Pt-2) Avail: NTIS CSCL 07/3

Thermogravimetric Analysis data of hundreds of aromatic-heterocyclic polymers, including AFML results as well as literature data, have been used to correlate structure with thermal stability. The temperature of the extrapolated onset of the first major breakdown step has been used as criterion for thermal stability. The results, by polymer classes, are listed. The maximum stabilities obtained for various polymers and moieties, the orders of stability of linking groups, the effect of o-, m-, p-substition, of crosslinking, molecular weight, side groups and other factors have been discussed. An attempt has also been made to correlate TGA data with isothermal aging data in air. GRA

N75-31269# National Bureau of Standards, Washington, D.C. Inorganic Materials Div.
A NEW MODE OF CHIPPING FRACTURE IN BRITTLE SOLIDS, AND ITS APPLICATION IN A MODEL FOR WEAR UNDER FIXED ABRASIVE CONDITIONS. PART 1: MODE OF CHIPPING FRACTURE. PART 2: WEAR MODEL Interim Report, 1 Jul. 1974 - 30 Jun. 1975
B. R. Laun 30 Jun. 1975 50 p refs Sponsored in part by ONR, Arlington, Va.
(COM-75-10515/5; NBSIR-75-659) Avail: NTIS HC $3.75 CSCL 20K

A description is given of the mode of chipping fracture observed in highly brittle solids. It is pointed out that residual stresses about indentation deformation centers play a vital role. The implications of this mode in a number of mechanical phenomena are discussed. An explicit model for the wear of brittle surfaces under fixed abrasive conditions is presented in terms of indentation fracture concepts. The predicted wear rate for glass agrees with that observed experimentally to within an order of magnitude. Some implications concerning the parameters which influence the abrasion process, particularly the hardness, are discussed. GRA

N75-31270# Horizons, Inc., Cleveland, Ohio.
POLY(ARYLOXYPHOSPHAZENE) FOAMS Final Technical Report, 15 Jun. 1973 - 15 Jun. 1974
Kenneth A. Reynard, Richard W. Sicka, and James F. Thompson Jun. 1974 70 p, refs
(Contract N00024-73-C-5474)
(AD-A009425) Avail: NTIS CSCL 07/3

A new family of polymers based on the phosphorus-nitrogen backbone, the poly(aryloxyphosphazenes), was investigated as fire-retardant materials to replace existing materials. The poly(aryloxyphosphazenes) have a high degree of flame retardancy and excellent dielectric properties. Efforts were devoted to synthesis of ((C6H5O)2PN-(4-C2H5C6H4O)2PN)n and evaluation of methods for formation of expanded closed cell foams of low density. Vulcanizates of this polymer (unexpanded) were found to possess adequate tensile strength (2410 psi) and elongation (380%). Studies of these foams for use as thermal insulation showed times to vision obscuration at least seven times as long as currently used fire-retardant marine thermal insulation. Little generation of toxic or corrosive products upon burning of the poly(aryloxyphosphazene) was found. Foams of approximately 6 lbs/cu ft density were produced by the use of chemical blowing agents and molding and curing under controlled pressure at temperature. Flame spread indices were obtained. Their physical and mechanical properties met the standards defined by MIL P-0015280F. GRA

N75-31271# Army Foreign Science and Technology Center, Charlottesville, Va.
HANDBOOK OF SOVIET MOLDED AND FORMED PLASTICS
Lowell I. Koht, Gus G. Orphanides, and Arthur F. Readdy, Jr. Apr. 1975 243 p
(AD-A009666; FSTC-HB-01-101-75) Avail: NTIS CSCL 11/9

This report presents a narrative analysis of Soviet conventional and high performance, filled and unfilled, thermoplastic and thermosetting plastics. Tabular data on the properties, compositions, designations and characteristics of the materials are presented. It presents potential or known applications of the plastics. Comparative analysis of U.S. and U.S.S.R. plastics programs is presented in tabular form. Known and estimated processing techniques are presented in tabular form. GRA

N75-31272# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
THE MECHANICAL BEHAVIOR OF POLY(METHYL METHACRYLATE) UNDER PRESSURE
K. Matsushige, S. V. Radcliffe, and E. Baer 3 Feb. 1975 46 p refs
(Contract N00014-67-A-0404-0013; NR Proj. 039-120)
(AD-A009863; TR-270) Avail: NTIS CSCL 20/12

Tensile deformation of poly(methyl methacrylate) carried out under hydrostatic pressure up to 4 kb has shown that the pressure-transmitting fluid (silicon oil) strongly affects the mechanical properties of this polymer. Unsealed specimens

fractured in a brittle manner at almost the same strain of 5% in the whole pressure range examined, while specimens sealed with Teflon tape and rubber showed a brittle to ductile transition at only 0.25 kb. At this pressure, the craze initiation and shear band initiation stresses were found to become equal. The pressure dependency of the shear band initiation stress could be expressed well with a non-linear pressure dependent von Mises criterion and the onset of the shear banding was proved to relate to the enthalpy energy density stored in the specimen. The combination of the non-linear pressure dependent von Mises criterion and the enthalpy energy density concept enabled us to predict the pressure dependency of Young's modulus. GRA

N75-31273# General Electric Co., Schenectady, N.Y. Corporate Research and Development.
CERAMIC SINTERING Semiannual Technical Report, 1 Nov. 1974 - 30 Apr. 1975
Charles D. Greskovich and Joseph H. Rosolowski Apr. 1975 62 p refs
(Contract N00014-74-C-0331; ARPA Order 2698)
(AD-A009867; SRD-75-047) Avail: NTIS CSCL 11/2

Microstructure development during the sintering of densifying and non-densifying powders of beta-SiC was observed. The kinetics of grain growth and porosity decrease in the densifying powders, as well as the microstructure development, were found to be very similar to those observed in oxide powders. It was found that the resistivity of B containing, dense sintered beta-SiC could be changed through compensation of the B acceptors by N donors introduced from the sintering furnace atmosphere during firing. The thermal EMF of a junction made of p and n types of dense, sintered beta-SiC was measured over the temperature range from 100C to 1500C. GRA

N75-31274# Army Foreign Science and Technology Center, Charlottesville, Va.
PRODUCTION OF CERAMIC CONSTRUCTION MATERIALS
N. Ya. Gosin 5 Jul. 1974 273 p refs Transl. into ENGLISH from Mono. Proizv. Keram. Stroit. Materialov (Moscow), 1971 198 p
(AD-A009562; FSTC-HT-23-0749-74) Avail: NTIS CSCL 11/2

The entire scope of production of ceramic products for construction is discussed. Information is presented on the various processes involved in getting the clay out of the ground and to the plant, in processing different types of clays and nonplastic materials, and in turning out different types of finished products of it. Various types of machines used in the production of ceramic products are described, along with operating instructions, possible malfunctions and methods for eliminating them. Information is also included on safety practices and establishment of output standards and wage scales. GRA

N75-31275# Army Materials and Mechanics Research Center, Watertown, Mass.
SLICE SYNTHESIS OF A THREE-DIMENSIONAL WORK OF FRACTURE SPECIMEN Final Report
Joseph I. Bluhm Feb. 1975 20 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A009731; AMMRC-TR-75-3) Avail: NTIS CSCL 11/2

In the evaluation of brittle materials such as ceramics, the work-of-fracture specimen is enjoying considerable interest. That specimen, basically a beam bending specimen with rectangular cross section, has inclined notches machined such that the remaining ligament is an isosceles triangle with the apex on the tension surface. The specimen is of particular interest because it tends to provide for slow stable crack propagation in such materials. This report presents the results of an attempt to analyze this truly three-dimensional problem in an approximate two-dimensional fashion, treating the specimen as a series of slices with correction for interslice shear effects. Both beam bending and beam shear effects on compliance are considered. Comparison of experimental and analytical results is discussed. The observed stability characteristics of the work-of-fracture specimen is discussed in light of these results. GRA

N75-31276# United Aircraft Corp., East Hartford, Conn.
DEVELOPMENT OF FIBER REINFORCED CERAMIC MATRIX COMPOSITES Final Report, Mar. 1974 - Mar. 1975
John J. Brennan Feb. 1975 69 p refs
(Contract N62269-74-C-0359)
(AD-A009360; UARL-R911848-4) Avail: NTIS CSCL 11/4

Hot-pressed silicon nitride (Si3N4) is a leading candidate for use in advanced gas turbine engines. Using an improved matrix material of Si3N4 - 10 wt % Y2O3, Ta reinforced Si3N4 composites have shown excellent thermal fatigue and thermal shock properties in addition to much improved impact resistance when compared to unreinforced Si3N4. Ballistic impact tests at 1300C have shown that the threshold energy below which no damage occurs upon impact for Si3N4-Ta composites is on the order of five times greater than for unreinforced Si3N4. Creep tests at 1300C, 15,000 psi, have shown the Ta reinforced Si3N4 - 10% Y2O3 sample performing as well, or even better than, the unreinforced sample. In addition, component vane and wedge shapes of dense Si3N4 and Si3N4 reinforced with Ta wires have been formed with minimal finish grinding using the pseudo-isostatic hot-pressing technique. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N75-31277# Institut Franco-Allemand de Recherches, St. Louis (France).
STANDARD PROCEDURE FOR STUDYING THE SENSITIVITY TO SHOCK WAVES OF CONDENSATED EXPLOSIVES. APPLICATION TO A CAST COMPOSITE [DESCRIPTION D'UN MODE OPERATOIRE STANDARD POUR L'ETUDE DE LA SENSIBILITE DES EXPLOSIFS CONDENSES A L'ONDE DE CHOC. APPLICATION A UNE COMPOSITION COULEE]
Y. DeLongueville 22 May 1974 77 p refs In FRENCH
(Contract SNPE-14/73/D)
(ISL-19/74) Avail: NTIS HC $4.75

A shock wave generator providing plane impacts on a surface is described. Wave profiles induced in a material were examined. A standard procedure for measuring condensate explosive shock sensitivity was tested in a specimen composition. Results are displayed as shock duration-pressure curves representing sensitivity thresholds. ESRO

N75-31278# Institut Franco-Allemand de Recherches, St. Louis (France).
TOWARDS A NEW COMPUTATION OF THE HOLLOW CHARGE [VERS UN NOUVEAU FORMALISME DE LA CHARGE CREUSE]
E. Perez and C. Fauquignon 11 Feb. 1975 24 p refs In FRENCH
(ISL-3/75) Avail: NTIS HC $3.25

The basis of a formal treatment of the collision process of a hollow charge (considering inelastic shock, local compressibility, and interaction among adjacent elements) and the coaxial evolution of the metal coating are presented. The formation of a unique set is described for the numerical computation. A treatment of conical implosions is applied. ESRO

N75-31279# Western Michigan Univ., Kalamazoo. Dept. of Chemistry.
RATES AND MECHANISMS OF REACTIONS OF FLUORINE CONTAINING ROCKET PROPELLANTS Final Report, 1 Sep. 1971 - 31 Oct. 1974
Thomas Houser Feb. 1975 21 p refs
(Contract AF-AFOSR-2160-72; AF Proj. 9750; AF Proj. 6813)
(AD-A008873; AFOSR-75-0591TR) Avail: NTIS CSCL 07/2

The rate of OF2 pyrolysis was rechecked using a magnesium reactor. The order was again found to be less than one for OF2 diluted with He, consistent with the previous data from the monel reactor. A mechanism was proposed consistent with this and other recent pyrolysis data. Attempts at obtaining

reproducible, meaningful kinetic data for the H2-N2F4 reaction were not successful. The remainder of the effort was concentrated on obtaining rate data for the H2-OF2 reaction in the magnesium reactor. The stoichiometry was determined. There was no significant change in rate on increasing the surface area by a factor of three. The mechanistic implications of the rate data were discussed, however no completely satisfactory mechanism was devised. GRA

N75-31280# Army Materiel Command, Texarkana, Tex. Intern Training Center.
EVALUATION OF THE EFFECTS OF ENGINE DETERIORATION ON GASOLINE EXHAUST EMISSION Final Report
Allen L. Payne Apr. 1975 50 p refs
(AD-A009281; USAMC-ITC-02-08-75-101) Avail: NTIS CSCL 21/7

This paper discusses the design of an experiment to determine the relationship between gasoline exhaust emissions and engine deterioration. The experimental design is specifically aimed at exhaust emission trends throughout engine life. The engines used for this experiment are four 4 1/2 h.p. Wisconsin, Model MBKND, air cooled, reciprocating gasoline engines. The experimental techniques presented provide a good foundation for further research. GRA

N75-31281# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
ENGINE-FUEL AND LUBRICANT COMPATIBILITY TESTS ON MIL-L-2104C OILS USING ENGINE MODEL 6V53T AND HIGH SULFUR FUEL Report for Jun. - Sep. 1973
E. A. Frame, S. J. Lestz, and A. A. Johnston Sep. 1974 124 p refs
(Contract DAAD05-70-C-0250)
(AD-A009527; AFLRL-26) Avail: NTIS CSCL 21/4

Earlier work in this program showed that two MIL-L-2104C lubricants were compatible with the two-cycle diesel engine model 6V53T when subjected to a targeted 210-hour laboratory-dynamometer endurance test cycle, operating with a reference No. 2 diesel fuel having a natural sulfur level of 0.42% wt. In that work, the low-ash (0.93% wt.) lubricant REO 203 demonstrated high-level engine capability, and the high-ash (1.75% wt.) lubricant REO 205 was judged borderline compatible with the 6V53T engine. In the current work, the use of high natural sulfur fuel (1.2% wt.) caused increased ringsticking and combustion chamber and ring zone deposits with REO 205 lubricant, and increased cylinder liner wear and intake port plugging with REO 203 lubricant. Based upon this performance, the 1.2% natural sulfur fuel was judged incompatible with the two-cycle diesel engine, model 6V53T. A recommendation for additional engine testing is made. GRA

N75-31282# Naval Academy, Annapolis, Md. Environmental Protection Research and Development Team.
MATERIALS PROBLEMS USING SYNTHETIC FUELS IN ENGINE COMBUSTORS Final Report, 1 Jul. - 31 Dec. 1974
Robert A. McCoy 1 Feb. 1975 17 p refs
(AD-A009810; USNA-EPRD-10) Avail: NTIS CSCL 21/4

This report briefly summarizes the results of a project designed to anticipate materials deterioration problems resulting from the use of synthetic fuels (fuels not derived from petroleum) in engine combustors. The project consisted of surveying organizations engaged in testing and evaluating synthetic fuels in engine combustion tests. Also the compositions and properties of various synthetic fuels were compiled and analyzed while relating these data to possible materials problems when these fuels are burned in engine combustors. This report identifies some rather minor materials problems encountered in the few short-term combustor tests run and reported upon to date. There appears to be no major materials problems associated with the use of synthetic fuels that cannot be remedied by special processing and treatments on the synthetic fuels. GRA

N75-31283# Stanford Research Inst., Menlo Park, Calif.
APPLICATION OF THERMALLY SENSITIVE BINDERS AS AN ORDNANCE DISPOSAL METHOD Final Progress Report, 26 Jan. - 24 Jul. 1974
Donald L. Ross, Dale G. Hendry, Gerald E. Manser, and Constance Gould 31 Jul. 1974 34 p refs
(Contract N00017-73-C-4329; SRI Proj. PYU-2426-11)
(AD-A009436; SRI-2426-6-F; PR-6) Avail: NTIS CSCL 19/1

The objective of the program is to develop experimental plastic boned explosives (PBXs) that will undergo controlled thermal degradation to give a processable material that can be removed easily from explosive casings and is therfore more readily disposable or recyclable. To achieve this objective the authors have continued development of azo-containing thermally degradable polyurethanes, which currently show the most promise as candidate binders. The authors also investigated thermally degradable carbonate- and amine oxide-containing polymers for potential use in thermally degradable PBXs in the same way that the azo-containing binder is being developed. During this contract the best candidate heat sensitive binder developed during previous work for NSSC was used to prepare an HMX-loaded PBX. The results indicate that the heat-sensitive binder approach should provide a practical means of facilitating future disposal and recycle of ordnance. Other heat sensitive groups were also prepared and tested to achieve binder decomposition at lower temperatures and shorter times than the binder described above. 1-Azobis-1-(p-hydroxyphenyl)ethane (PHPA) was incorporated into a linear polyurethane and the resultant polymer tested for its degradation characteristics. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-31284 Oregon State Univ., Corvallis.
A COLLECTIVE COORDINATE THEORY OF LIQUID HELIUM VIA THE GREEN'S FUNCTION EQUATIONS OF MOTION Ph.D. Thesis
George Earl Pynchon 1975 77 p
Avail: Univ. Microfilms Order No. 75-16816

The finite temperature density-density Green's function for liquid helium is calculated. Starting with a Hamiltonian written in terms of the collective coordinates corresponding to density fluctuations and velocity density, the equation of motion of the Green's function is developed taking into account 3-phonon and 4-phonon terms in the Hamiltonian. The 4-phonon term contributes a totally real part to the self energy and the equations must be continued to second order to include the 3-phonon terms. In second order, a system of three coupled equations for three different Green's functions must be evaluated. The 3-phonon terms result in the lowest order contribution to the lifetime of the excited states of the liquid. This contribution is evaluated in the long wavelength limit where the finite lifetime of the states is directly related to the ultrasonic attenuation. Dissert. Abstr.

N75-31285# Politecnico di Torino (Italy). Ist. di Macchine e Motori per Aeromobili.
CONTRIBUTION TO THE IMPROVEMENT OF THE REGULATING PROCESS OF IGNITION CONTROLLED ENGINES [CONTRIBUTO AL MIGLIORAMENTO DELLA CARATTERISTICA DI REGOLAZIONE DEI MOTORI AD ACCENSIONE COMANDATA]
Enrico Antonelli and Guido Colasurdo Jul. 1974 50 p refs In ITALIAN
(Publ-165) Avail: NTIS HC $3.75

A search for new methods of automobile fuel saving was carried out using a device to anticipate the closing of the aspiration valve. The corresponding mechanical set up is detailed and the method for determining the closure law is discussed by means of a specific fluid dynamic model: the equations are numerically solved. Special care is devoted to boundary values at cylinder level, valve level, and ducts, and to initial conditions and main engine characteristics. For velocities between 1000 and 6000 rpm the net theoretical saving is of the order of a few percent. ESRO

N75-31286# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
MACHINE TOOL PRECISION CONTROL USING LASERS [LE CONTROLE AU LASER DE LA PRECISION DE MAC-

HINES EN ATELIER]
Jan DeFraine and Leo Janssen May 1975 29 p refs In FRENCH
(CRIF-NT-11) Avail: NTIS HC $3.75

A laser interferometric method was applied to check out the performance of various machine tools. The principles of the method are outlined with regard to linear displacement measurement, automatic error recording, angular displacement measurement, and deviations from plane surfaces. Practical examples are given for milling machines and turret lathes of various makes. ESRO

N75-31287# Naval Surface Weapons Center, Dahlgren, Va.
DEVELOPMENT OF A SYSTEM TO SUPPRESS AND EXTINGUISH FULLY DEVELOPED COAL DUST EXPLOSIONS Final Report
D. B. Lull, L. D. Johnson, T. F. Morris, and J. A. Canfield Feb. 1975 227 p refs
(AD-A009852; NSWC/DL-TR-3151) Avail: NTIS CSCL 08/9

A working prototype triggered barrier system has been designed, built and tested. It has successfully suppressed and extinguished several propagating coal dust explosions in two shock tube facilities which are of significant scale relative to mine extries. Design and performance data on the suppression system and components are included. Flame front and pressure wave trajectories are plotted for several tests in which dust explosions were extinguished showing the operating time and the effects of the suppression system. GRA

N75-31288# Army Materiel Command, Texarkana, Tex. Intern Training Center.
A STUDY OF THE RELATIONSHIP OF BIORHYTHMS TO ACCIDENTS AT TWO AMC INSTALLATIONS Final Report
Dal Michael Nett Feb. 1975 75 p refs
(AD-A009319; USAMC-ITC-02-08-75-414) Avail: NTIS CSCL 13/12

The report presents a review of the biorhythms theory and an attempt to correlate the theory with the occurrence of accidents at Rock Island Arsenal and Lone Star Army Ammunition Plant. Samples of 200 accidents were taken from both installations and the positions of the biorhythm cycles of each accident victim were computed for their respective accident days. Almost no correlation between biorhythm critical days and accident days was found. GRA

N75-31289# Army Materiel Command, Texarkana, Tex. Intern Training Center.
DISCRETE TIME SERIES FORECAST OF ACCIDENT/INJURY FREQUENCY RATES IN THE ARMY MATERIEL COMMAND Final Report
Norbert Ronald Kniepp Mar. 1975 102 p refs
(AD-A009317; USAMC-ITC-02-08-75-409) Avail: NTIS CSCL 13/12

The research report attacks the problem of providing the safety engineer with a forecasting model that could be used as an effectiveness measure for newly instituted safety programs. Two mathematical forecasting techniques (conventional exponentially smoothed and adaptive exponentially smoothed forecasting) are used to obtain a predicted accident/injury frequency rate. The accuracies of these two techniques are compared and it is found that the conventionally smoothed forecasts provide the most accurate predicting model, but are not considered accurate enough to be used as a measure for program effectiveness. GRA

N75-31290# Army Materiel Command, Texarkana, Tex. Intern Training Center.
A SYSTEM SAFETY PROGRAM FOR NATICK LABORATORIES Final Report
Donald R. Boboige Apr. 1975 76 p refs
(AD-A009313; USAMC-ITC-02-08-75-402) Avail: NTIS CSCL 13/12

The report contains a proposed system safety program for implementation at Natick Laboratories, an AMC Research and Development Organization. In addition to a proposed local regulation implementing the system safety program, there is an in-depth presentation of the organization and analyses required for its operation. System safety requirements of the Department of Defense, Department of Army and Army Materiel Command are stressed throughout the report. All levels of management are covered, but, special emphasis is placed upon the role of the system safety engineer. GRA

N75-31291# Army Materiel Command, Texarkana, Tex. Intern Training Center.
CONTINGENCY PLAN FOR CONTROL AND TREATMENT OF ACCIDENTAL SPILLS OF TOXIC CHEMICALS FROM ELECTROPLATING PROCESSES Final Report
Robert A. Raby Mar. 1975 46 p refs
(AD-A009197; USAMC-ITC-02-08-75-216) Avail: NTIS CSCL 07/1

This report examines various methods for treating accidental spills of toxic chemicals in the electroplating shop at Red River Army Depot, Texarkana, Texas. Included are treatments for hexavalent chrome, cyanides and acids along with cost figures for each. Also included is a contingency plan for use by electroplating shop personnel concerning proper action in the event of a spill. GRA

N75-31292# National Bureau of Standards, Washington, D.C. Programmatic Center for Fire Research.
ATTACKING THE FIRE PROBLEM: A PLAN FOR ACTION Final Report
Kenneth Giles and Pamela Powell May 1975 42 p
(COM-75-10520/5) Avail: NTIS MF $2.25; SOD HC as C13.10:416 CSCL 13L

The mission of the Center for Fire Research is to insure the development of standards and specifications needed in support of the national goal to reduce fire losses by 50% over the next generation. A systems approach to accomplish this mission is described. The Center consists of three basis programs in the area of fire science and five applied research programs in the area of fire safety engineering. Each applied program addresses an aspect of the fire problem, using fundamental information supplied by the basic research function. Active participation by staff members in voluntary standards organizations is the principal means of making this technology available for codes and standards needed to reduce the Nation's fire loss. GRA

N75-31293# Naval Ship Research and Development Center, Bethesda, Md.
DESIGN GUIDELINES FOR IMPRESSED-CURRENT CATHODIC PROTECTION SYSTEMS ON SURFACE-EFFECT SHIPS
Harvey P. Hack May 1975 51 p
(AD-A009765; NSRDC-4531) Avail: NTIS CSCL 13/10

The report presents results of various tests performed to establish design guidelines for the use of impressed-current cathodic protection systems on surface-effect ships. These results show that commercially available reference cells can be used in this application, and that dielectric shield materials, which can withstand the applied voltages, are available. Size limits were set for dielectric shields on the SES-1 OOB. A protection potential of -1150 millivolts was found to protect galvanic couples of surface-effect ship materials adequately at 90knot velocities. Finally, updated design guidelines for impressed-current cathodic protection systems on surface-effect ships are presented. GRA

N75-31294# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
SEAKEEPING CHARACTERISTICS OF THE XR-5, A HIGH LENGTH-BEAM RATIO MANNED SURFACE EFFECT TESTCRAFT. 1. XR-5 MODEL RESPONSE IN REGULAR HEAD WAVES
Allen H. Magnuson and Kathryn K. Wolff Mar. 1975 89 p refs
(AD-A009761; SPD-616-01) Avail: NTIS CSCL 13/10

Motion response data for regular waves in head seas is presented for a model of a high length/beam ratio surface effect ship (SES). Data is presented in normalized form for pitch, heave, relative bow velocity, relative bow motion, stern seal motion, bow acceleration and heave acceleration. The pitch motion data exhibits a resonant or underdamped behavior governed by a constant natural frequency throughout the speed range investigated. The wave pumping effect was observed in the supercritical frequency range, and was particularly evident

in the normalized acceleration data. The relative bow motion exhibits a pronounced peak at a frequency slightly above the pitching natural frequency. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N75-31295+ Engineering Sciences Data Unit, London (England).
BUCKLING OF LONG FLAT ORTHOTROPIC PLATES IN SHEAR
Feb. 1974 4 p Amendment A
(ESDU-74005) Copyright. Avail: NTIS HC $26.50

A method for determining the buckling load intensity under in-plane shear of isotropic or orthotropic plates the edges of which are elastically restrained against rotation is presented. The method is applicable to shear load carrying flat plates manufactured from materials that may be described as orthotropic, for example laminate composite materials such as metal, glass or carbon fibers in a matrix, or wood laminates. The data are applicable to all thin plates in which the principal axes of orthotropy lie along and across the plate. Author

N75-31296 Purdue Univ., Lafayette, Ind.
SPECTRUM UTILIZATION EFFICIENCY IN LAND MOBILE RADIO SERVICE Ph.D. Thesis
Robert Gene Finch 1974 120 p
Avail: Univ. Microfilms Order No. 75-17193

A cellular system with a fixed base station at the center of each cell is analyzed. The system provided two-way communication via radio transmission between any mobile unit and a base station located within the same cell as the mobile unit. All base stations are connected via land lines or microwave links to a central processing unit where all system control functions are coordinated and executed. A criterion for comparing the utilization efficiency of different systems is defined as the average number of users per megahertz per square kilometer. In order to evaluate this criterion, the co-channel interference resulting from the reuse of the same portion of the radio frequency spectrum in other cells is determined as a function of cell size. It is shown that the co-channel interference is reduced if the transmitted power is controlled such that only the amount of power required for a given quality of service is transmitted. Dissert. Abstr.

N75-31297 Purdue Univ., Lafayette, Ind.
HIGH RESOLUTION VELOCITY ESTIMATION IN THE PRESENCE OF EXTENDED CLUTTER Ph.D. Thesis
Mostafa Kaveh 1974 183 p
Avail: Univ. Microfilms Order No. 75-17223

The problem of measuring the velocity spectrum of a radar target in extended clutter was studied. The performance of a random signal radar operating in a uniform clutter medium that extends from the radar antenna to the target was specifically investigated. The generalized ambiguity function of the randomly staggered pulsed random signal radar was derived through the introduction of functions of pulse occurrence times. It is shown that the frequency behavior of the ambiguity function is largely determined by the characteristic function of the inter-pulse spacing. An example of radar operation in rain clutter is treated. An autoregressive spectral estimator was used to make high resolution spectral estimates based on short data records. Measurements of raindrop velocities with the combination of a pulsed random signal radar and an autoregressive spectral estimator were made to show the feasibility of the system in making meteorological measurements over short time intervals. Dissert. Abstr.

N75-31298 Kansas Univ., Lawrence.
INVESTIGATION OF RADAR DISCRIMINATION OF SEA ICE Ph.D. Thesis
Surendra Kumar Parashar 1974 398 p
Avail: Univ. Microfilms Order No. 75-17655

The ability of radar to discriminate sea ice types and their thickness was studied. Radar backscatter measurements at 400 MHz (multi-polarization) and 13.3 GHz (VV Polarization) were analyzed in detail. The scatterometer data were separated into seven categories of sea ice according to age and thickness as interpreted from stereo aerial photographs. Although 400 MHz is not as satisfactory for ice identification as 13.3 GHz, combining a 13.3 GHz and a 400 MHz system definitely eliminates the ambiguity regarding very thin ice. Four-polarization 16.5 GHz radar imagery was also obtained. Open water and three categories of sea ice can be identified on the images. The results of the imagery analysis are consistent with the radar scatterometer results. An analytical theory of radar scatter from sea ice was developed by taking into account the amount of brine entrapped, temperature, and surface roughness. Numerical calculations were performed for polarized radar backscatter for the six ice types at 400 MHz and 13.3 GHz. The computed results are in general agreement with the experimental results despite the fact that no 'ground truth' information was available. Dissert. Abstr.

N75-31299*# Ohio Univ., Athens. Avionics Engineering Center.
LOW-COST, HIGH-PERFORMANCE, VLF RECEIVER FRONT-END
R. W. Burhans Sep. 1975 28 p refs
(Grant NGR-36-009-017-TM-18)
(NASA-CR-143475) Avail: NTIS HC $3.75 CSCL 17B

A VLF receiver front-end was designed using standard linear integrated circuits. The basic methods were evaluated extensively on the Omega 10.2 KHz channel but are readily adaptable to any other VLF frequency in the 10.2 KHz to 20 KHz region. Applications for the modules exist in position location, time-frequency measurements, and signal propagation. The set provides control gates, zero crossing signals, and analog outputs to interface with any type of digital logic, microprocessor, or analog signal processor. Author

N75-31300*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SINGLE- AND DUAL-CARRIER MICROWAVE NOISE ABATEMENT IN THE DEEP SPACE NETWORK
D. A. Bathker, D. W. Brown, and S. M. Petty 1 Aug. 1975 149 p refs
(Contract NAS7-100)
(NASA-CR-143484; JPL-TM-33-733) Avail: NTIS HC $5.75 CSCL 17B

The NASA/JPL Deep Space Network (DSN) microwave ground antenna systems are presented which simultaneously uplink very high power S-band signals while receiving very low level S- and X-band downlinks. Tertiary mechanisms associated with elements give rise to self-interference in the forms of broadband noise burst and coherent intermodulation products. A long-term program to reduce or eliminate both forms of interference is described in detail. Two DSN antennas were subjected to extensive interference testing and practical cleanup program; the initial performance, modification details, and final performance achieved at several planned stages are discussed. Test equipment and field procedures found useful in locating interference sources are discussed. Practices deemed necessary for interference-free operations in the DSN are described. Much of the specific information given is expected to be easily generalized for application in a variety of similar installations. Recommendations for future investigations and individual element design are given. Author

N75-31301# Japan Broadcasting Corp., Tokyo.
RECORDING CHARACTERISTICS OF THERMOMAGNETIC ANALOG RECORDING
Tatsuo Nomura and Katsuya Yokoyama Jun. 1975 8 p refs
(NHK-Labs-Note-186) Avail: NTIS HC $3.25

The thermomagnetic analog recording method is described along with the experimental apparatus for this recording system. Experimental results are also presented and discussed. M.J.S.

N75-31302# Japan Broadcasting Corp., Tokyo.
BROADCASTING OF STILL IMAGES: A REVIEW
Yasutaka Numaguchi Jul. 1975 17 p refs
(NHK-Labs-Note-187) Avail: NTIS HC $3.25

Broadcasting of still images is discussed which is characterized

by maximum utilization of the most economical broadcasting medium (broadcasting waves); this enables an increase in the number of programs broadcast, as well as provides a form of broadcasting service. Author

N75-31303# Japan Broadcasting Corp., Tokyo.
COLLECTOR POTENTIAL DEPRESSED KLYSTRON FOR UHF-TV TRANSMITTER
Shigemoto Murata, Kaizo Yamamoto, Yoji Morishita, and Noboru Mizushima May 1975 10 p refs
(NHK-Labs-Note-185) Avail: NTIS HC $3.25

Although only a small amount of improvement in efficiency was expected from the saturated operation of klystrons by collector potential depression (CPD), a larger amount of improvement in average efficiency in AM signal amplification was obtained by using a klystron with a two-stage collector. A back-streaming current owing to CPD is sometimes troublesome because feedback from this current degrades high-frequency performance. A method for eliminating this back-streaming current is proposed. A magnetic lens provided at the entrance of the collector focuses the electron beam so as to obtain its minimum size near the potential depressing domain and to obtain a diverging field for electrons which prevents the occurrence of the back-streaming current. This type is called a convergent injection collector (CIC). The best result obtained by using an experimental klystron with a CIC is an improvement of about 1.5 times in average efficiency for TV visual service. Author

N75-31304# Lockheed Missiles and Space Co., Palo Alto, Calif.
INSTANTANEOUS POLARIZATION PARAMETERS OF TWO-DIMENSIONAL SIGNALS, CHAPTER 2
K. G. Gusev, A. D. Filatov, and A. P. Sopolev 1974 14 p Transl. into ENGLISH from the book "Poliarizatsionnaia Moduliatsiia" Moscow, Sovetskoe Radio, 1974 p 48-63
Avail: NTIS HC $3.25; National Translation Center, John Crerar Library, Chicago, Illinois 60616

The polarization parameters phi (t), theta (t), and psi (t) were determined by means of electromagnetic wave projections given on the coordinate axes. Author

N75-31305# Lockheed Missiles and Space Co., Palo Alto, Calif.
SIGNALS WITH CONTINUOUS POLARIZATION MODULATION
K. G. Gusev, A. D. Filatov, and A. P. Sopolev 1974 18 p Transl. into ENGLISH from the book "Poliarizatsionnaia Moduliatsiia" Moscow, Sovetskoe Radio, 1974 p 83-109
Avail: NTIS HC $3.25; National Translation Center, John Crerar Library, Chicago, Ill. 60616

Modulation of polarization parameters by continuous harmonic oscillations in order to analyze the spectral structure of polarization modulation (PM) signals is discussed. This process permits obtaining and analyzing discrete PM signals without excess difficulties. Author

N75-31306# Fondazione Ugo Bordoni, Rome (Italy).
EVALUATION OF THE DIFFUSION COMPONENT AROUND 7 GHz FOR A MARITIME RADIO RELAY LINK [VALUTAZIONE DELLE COMPONENTI DI DIFFUSIONE, NELLA GAMMA DEI 7 GHz, PER UNA TRATTA IN PONTE RADIO SU MARE]
Angelo Bernardini and Gianfranco Meucci 2 Aug. 1974 21 p refs In ITALIAN
Avail: NTIS $3.25

The effect of tropospheric scattering and sea reflection on wave propagation at 7 GHz in point to point communication radio relay link were studied using mathematical models to determine diffusion cross reactions and power spectra. For the tropospheric scattering two models were used; the first makes use of the existence of vortices even outside the propagation axis, the second uses the refractive index variation along the electromagnetic ray. The rms of the phase, the phase spectrum, the received signal amplitude, and receiving angle were determined. For the sea water diffusion the model considers a main wave with small superposed perturbations. The scattering cross sections were determined together with the power spectrum evidencing the perturbation influence, maximum frequency dependence, and spectrum broadening due to geometric dimensions of the supporting sea wave. ESRO

N75-31307# Fondazione Ugo Bordoni, Rome (Italy).
EXPERIMENTAL PROBING METHOD BY DIRECT RECORDING OF THE IMPULSE RESPONSE ON A RADIO LINK IN LINES OF SIGHT. PART 1: ANALYTIC AND CIRCUIT PHENOMENOLOGICAL ASPECTS OF THE TRANSMITTING MEDIUM CHARACTERISTICS [METODO DI INDAGINE SPERIMENTALE, MEDIANTE RILEVAMENTO DIRETTO DELLA RISPOSTA IMPULSIVA, SU UNA TRATTA DI PONTE RADIO IN VISIBILITA. PARTE 1: ASPETTI FENOMENOLOGICI ANALITICI E CIRCUITALI DELLE CARATTERISTICHE DEL MEZZO TRANSMISSIVO]
Guido diBlasio 3 Aug. 1974 42 p refs In ITALIAN
Avail: NTIS HC $3.75

Various ways of representing the behavior of an electromagnetic wave transmitting device by analytical models and their circuit counterpart are presented. In view of application to point-to-point communication by Hertzian relays the diffraction by an obstacle, multipath transmission diffraction and sea reflection, focalization, fade out and scintillation are discussed. ESRO

N75-31308# Fondazione Ugo Bordoni, Rome (Italy).
EFFECTS OF ATMOSPHERIC CONDITIONS ON ELECTROMAGNETIC WAVE PROPAGATION AT FREQUENCIES HIGHER THAN 10 GHz AND SYSTEMS DESIGN OF TERRESTRIAL TELECOMMUNICATION PROJECTS [INFLUENZA DELLE CONDIZIONI ATMOSFERICHE SULLA PROPAGAZIONE DELLE ONDE E. M. A FREQUENZE SUPERIORI A 10 GHz E CRITERI DI PROGETTO DI SISTEMI DI TELECOMMUNICAZIONE TERRESTRI A TALI FREQUENZE]
F. Fedi, R. Koch, and B. Peroni 24 Oct. 1974 45 p refs In ITALIAN
Avail: NTIS HC $3.75

A research program on the effects of atmospheric conditions on electromagnetic propagation at superhigh frequencies for point to point communications is reviewed. The various elements of the program are detailed including studies on tropospheric scattering, sea water reflection, rain gage data, correlation to similar European research projects, costs, and project management. ESRO

N75-31309# Royal Radar Establishment, Malvern (England).
Q-LINK: A PORTABLE 30 GHz SOLID-STATE 120 Mb/s DIGITAL RADIO
P. A. Volckman, S. E. Gibbs, and P. Denniss Sep. 1974 88 p refs
(RRE-TN-777; BR44986) Avail: NTIS HC $4.75

A short hop (2 to 5 km) digital data link which operates with a 30 GHz carrier frequency at 120 mb/s is described. The prototype transmitter consists of a 30 GHz impatt oscillator giving 100 mW is CW power followed by a p-i-n switch which is used to on/off modulate the carrier. Small parabolic reflectors are used to send and receive the information between the terminals, and the digital information is recovered by a superheterodyne receiver at the remote end. The link is a 2-way system in which the two channels are isolated by transmission in orthogonal polarization and separation in frequency. The terminals of the link are solid state modules having a volume of about 0.027 cu m and weighing only 12 kg, which makes them highly portable. Each module can process a digital data stream at rates exceeding 100 Mbits/sec. Possible applications are briefly discussed. ESRO

N75-31310# Heinrich-Hertz-Institute fuer Schwingungsforschung, Berlin (West Germany).
PROJECT STUDY VIDEO CONFERENCE. STATE-OF-THE-ART AND PROPOSALS FOR FURTHER DEVELOPMENTS Final Report [PROJEKTSTUDIE FERNSEHKONFERENZ. STAND DER TECHNIK UND VORSCHLAEGE FUER WEITERENTWICKLUNGEN]
Peter Guenther, Peter Neuhold, and Georg Plenge Bonn Bundesmin. fuer Forsch. u. Technol. Apr. 1975 72 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-75-01) Avail: NTIS HC $4.25; ZLDI, Munich DM 15.15

Problems with audio-visual communication are summarized

along with conferencing systems. The state of the art in video and audio techniques is discussed including audio direction reproduction, TV projection, and color representation. Developments concerning recording and presentation of TV pictures, the application of color, three-dimensional TV, and broadband transmission are reviewed. Author (ESRO)

N75-31311# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
FURTHER CONSIDERATIONS ON SATELLITE COMMUNICATION SYSTEMS APPLICABLE TO OFFSHORE GAS/OIL EXPLOITATION ACTIVITIES Final Report
H. Schuessler, comp. Jan. 1975 121 p
(Contract ESRO-SC/7/73-HQ)
(ESRO-CR(P)-648) Avail: NTIS HC $5.25

The system defined originally is compared with existing satellite communication systems, and items in the baseline systems concept, which may be subjected to further analysis or modification, are identified. As a result of this study, a possible 4/6 GHz system and a modified version of the 12 GHz baseline system concept proposed originally, are synthesized. It is concluded that the modified 12 GHz system, which features SCPC PCM/PSK, separate voice and data channels, and voice activation and voice channel demand assignment, provides maximum system capacity. It permits maximum flexibility and is also best suited to accommodate exploration rigs. ESRO

N75-31312# Ohio State Univ., Columbus. ElectroScience Lab.
ELECTROMAGNETIC DIRECTION FINDING TECHNIQUES Final Report
G. A. Thiele Mar. 1975 74 p refs
(Contract N00140-74-C-6017)
(AD-A009894; ESL-3735-3) Avail: NTIS CSCL 17/3

Research and development addressed to the problem of electromagnetic direction finding in the UHF frequency range are summarized. Both theoretical and experimental investigations are described under three topical headings which include the analysis of slot antennas on a conducting cylinder, the hardware development of a T-bar fed slot antenna, and the computer aided design of a lossy wire (distributively loaded) circular array. Recommendations for future investigations and hardware development are included. Author (GRA)

N75-31313# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A METHOD FOR DETERMINING THE FIELD STRENGTH DISTRIBUTION OF A TROPOSPHERIC SCATTER COMMUNICATIONS LINK M. S. Thesis - Final Report, Apr. - Dec. 1974
Arthur J. Balazs Dec. 1974 89 p refs
(AD-A008710; GE/EE/74-39) Avail: NTIS CSCL 17/2

A method is developed for determining the on and off path field strengths for a typical tropospheric scatter communications link. The earth is assumed to be smooth and homogeneous over the entire path. A spherically symmetric atmospheric model is used. Meteorological conditions which affect tropospheric communications are discussed as well as a method for determining the refractive index from meteorological charts. A field source representation is developed which can be easily adapted to specific site facilities. The overall field problem is developed in four parts: the direct field, the reflected field, the diffracted field and the scattered field. GRA

N75-31314# Army Materiel Command, Texarkana, Tex. Intern Training Center.
A QUALITATIVE MAINTAINABILITY STUDY OF THE RANGE-ONLY-RADAR FOR THE VULCAN AIR DEFENSE SYSTEM Final Report
James A. Bass Apr. 1975 93 p refs
(AD-A009280; USAMC-ITC-02-08-75-018) Avail: NTIS CSCL 17/9

The paper contains the results of a qualitative maintainability study on the Vulcan Air Defense Range-Only Radar, the AN/VPS-2, and is oriented toward the organizational level of repair. Included in the report is a discussion of the current operational readiness improvement program of the radar. A description of the system and its history provide the reader with an understanding of why the AN/VPS-2 is experiencing reliability-maintainability problems. Two maintainability areas related to the radar are stressed: (1) hardware design ealuation, and (2) personnel and training. Recommendations, related costs, and impact on operational readiness are given as appropriate. GRA

N75-31315# Aerospace Corp., El Segundo, Calif.
A MODEL FOR TARGET SCINTILLATION Interim Report
D. J. Reifer 20 Dec. 1974 25 p refs
(Contract F04701-74-C-0075)
(AD-A009139; TR-0075(5112)-1; SAMSO-TR-75-107) Avail: NTIS CSCL 17/9

This report discusses the implementation of an algorithm used to simulate target scintillation. The algorithm takes uniform random noise and modifies it using a simulated low-pass filter to produce estimates of target strength. The actual implementation statistics are compared with the theoretical distribution to ascertain the usefulness of the approach. GRA

N75-31316# Braddock, Dunn and McDonald, Inc., Albuquerque, N.Mex.
SPACE OBJECT SCATTERING DENSITY SYNTHESIS, VOLUME 1 Final Technical Report
J. S. Yu and J. W. Williams Mar. 1975 129 p refs
(Contract F30602-73-C-0343; AF Proj. 4506)
(AD-A009872; BDM/A-113-74-TR; RADC-TR-75-55-Vol-1) Avail: NTIS

The procedure of digital image synthesis is developed to construct the scattering density of axially symmetric objects. The principle of synthetic aperture radar is employed to provide the planar resolutions of a space object. Necessary data for the synthesis are generated by computer programs to simulate both the time-and frequency-domain outputs of coherent detectors. A primitive image processor is used to select only useful images at various aspect angles and synthesize a composite image in the presence of shot noises generated in the short pulse data. Examples are given to demonstrate the clarity and uniqueness of images that can be constructed for a given resolution capability. Some practical considerations are discussed with respect to processing real-life data collected by operational radars. GRA

N75-31317# Air Force Communications Service, Richards-Gebaur AFB, Mo. Digital Network Systems Facility.
RADIO SERVICE CHANNEL TECHNIQUES IN A DIGITAL COMMUNICATIONS SYSTEM Final Report
David A. Lindberg 31 Mar. 1975 77 p
(AD-A009596; DNSF-TR-75-100) Avail: NTIS CSCL 17/2

The report describes several radio service channel techniques that are candidates for use in the future Defense Communications System (DCS) digital upgrades. Overall operational and maintenance requirements and desires are discussed and used to evaluate the different techniques in determining the most desirable alternative. Both analog and digital radios are considered in the evaluation. Auxiliary service channel TDM equipment including the orderwire switching network and telemetry equipment are discussed in attachments to this report. A recommendation on the type of radio service channel to be used in the DCS is presented in the conclusion of this report. GRA

N75-31318# Air Force Communications Service, Richards-Gebaur AFB, Mo.
DIGITAL COMMUNICATION SYSTEM OFFSET THRESHOLD MONITOR Final Report
Richard P. Stibor Apr. 1975 46 p refs
(AD-A009598; DNSF-TR-75-102) Avail: NTIS CSCL 17/2

An offset-Threshold Degradation Monitor is developed which provides an operation and maintenance tool that measures the overall end-to-end performance in a Digital Communication System. The monitor derives performance information from the unregenerated partial-response waveform (eye pattern) found in most systems immediately prior to regeneration of the digital intelligence. Monitor performance tests indicate a sensitivity in excess of a 40 db signal-to-noise ratio for detecting additive noise which provides degradation information 20 db in advance of a 10 to the minus 7 power BER. GRA

N75-31319# Air Force Communications Service, Richards-Gebaur AFB, Mo. Digital Network Systems Facility.
DIGITAL COMMUNICATION SYSTEM IMPROVED OFFSET TIMING MONITOR Final Report
Warren J. Boxleitner 31 Mar. 1975 18 p
(AD-A009597; DNSF-TR-75-101) Avail: NTIS CSCL 17/2

The report investigates an improved degradation monitor for three-level partial response signals. The exact reaction of this offset timing monitor to different baseband signal-to-noise ratios is recorded. GRA

N75-31320# RDP, Inc., Bedford, Mass.
MATHEMATICAL ANALYSIS AND SCIENTIFIC APPLICATIONS PROGRAMMING REPORT Final Report, 16 Aug. 1972 - 30 Nov. 1974
Joseph F. Russell, Jr., ed. 31 Dec. 1974 71 p ref
(Contract F19628-73-C-0027)
(AD-A009631; AFCRL-TR-75-0043) Avail: NTIS CSCL 20/14

A description is presented of the mathematical and numerical analysis and scientific applications programming support for basic research in the environmental sciences. Topics discussed include: distortions of radio pulses in the ionosphere, frequency response of a one-dimensionally extended antenna, analysis of the mesoscale variability of artillery ballistic winds, a numerical model of the dynamics of the thermosphere, sharp cut-off nonrecursive filter design, potential in a plasma in a magnetic field, Maxflat and Butterworth nonrecursive digital filters, flat frequency response using unity magnitude impulse response, study of a dielectric slab in a waveguide, mutual coupling and reflection coefficients in a conformal array antenna, radiation patterns in a conformal array antenna, analysis of waveguide function, electron capture, analysis of electric fields in visual aurora, and net space-charge limited current flow. M.J.S.

N75-31321# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE STATISTICAL CHARACTERISTICS OF DIFFUSE MULTIPATH RADIATION AND ITS EFFECT ON ANTENNA PERFORMANCE
Terrence P. McGarty 25 Mar. 1975 166 p refs
(Contracts F19628-73-C-0002; DOT-FA72WAI-261)
(AD-A009869; TN-1975-11; ESD-TR-75-145) Avail: NTIS CSCL 20/14

Diffuse multipath is a random phenomenon that arises out of the diffraction of waves from rough surfaces. This form of multipath can, in turn, affect the angle estimation performance of monopulse antenna systems. In order to evaluate its effect, it is necessary to obtain the channel spread function that results. This function is basically the wave number spectrum of the resulting random field generated by the scattering. To do this, use is made of the Kodis-Barrick scattering cross section and Wagner's shadowing function. The evaluation is performed for the specific geometry of a spherical earth. Evaluation of the system performance degradation is also made for various system configurations. GRA

N75-31322# Georgia Inst. of Tech., Atlanta. Health Systems Research Center.
TELEMETRY UTILIZATION FOR EMERGENCY MEDICAL SERVICES SYSTEM Final Report, 30 Jun. 1972 - 29 Jun. 1974
Harold E. Smalley Jun. 1974 76 p refs
(Grant PHS-HS-00715)
(PB-242083/4; NCHSR-75/107) Avail: NTIS HC $4.75 CSCL 06E

The document is a guide for health planners and emergency medical services (EMS) personnel to assist in the determination of the feasibility of telemetry utilization in their own EMS system. The report can serve as an aid in designing new and improved EMS systems, and employs information furnished by the user to determine the desirability, possibility, and necessity of using telemetry in order to achieve an effective level of emergency coronary care. Procedures within the guide permit the user to evaluate his own EMS system and the signification of various factors for consideration in the issue of telemetry utilization. GRA

N75-31323# Naval Research Lab., Washington, D.C.
A GENERAL DERIVATION OF THE CONSERVATION EQUATION FOR WAVE ACTION
Wallace M. Manheimer Apr. 1975 16 p refs
(NNRL Proj. R02-37)
(AD-A009797; NRL-MR-3008) Avail: NTIS CSCL 20/9

The conservation equation for wave action density and the wave Liouville equation are derived for general dispersive, dissipative media. The derivation of the conservation equation follows from a straightforward extension of the WKB method to time varying media. GRA

N75-31324# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A MODEL FOR PREDICTING THE RAIN BACKSCATTER FROM A 70-GHz RADAR Final Report
Alan R. Downs Mar. 1975 59 p refs
(AD-A009699; BRL-MR-2467) Avail: NTIS CSCL 17/9

A mathematical model requiring little computer time has been developed to predict the intensity of 70-GHz radar backscatter by rain. The backscatter model is based on an optical radiative transfer model developed under the AMC Target Signature Analysis Program. The described approach was taken in order to develop a backscatter equation independent of the radar frequency so that the equation can be solved by specifying the needed frequency dependent inputs. The backscatter equation is derived and the inputs pertaining to 70 GHz are calculated and presented in the form of graphs and tables. The backscatter equation is then solved and a table generated to predict various backscatter formulations as a function of rainfall rate and distance from the antenna. A discussion of error sources and suggested future research is also included. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-31325 California Univ., Los Angeles.
THRESHOLD SWITCHING IN NON-CRYSTALLINE SYSTEMS Ph.D. Thesis
Elroy Clyde Smith, Jr. 1975 302 p
Avail: Univ. Microfilms Order No. 75-16796

Threshold switches based upon amorphous semiconductors possess a number of attractive features. Experimental work was undertaken to evaluate the most promising materials and fabrication method. Oxide glasses based upon V2O5 and P2O5 were prepared and compounded into the form of ink, then thick film techniques were used to prepare switches. An amplifier circuit was designed, analyzed, fabricated, and tested incorporating the amorphous semiconductor switches. Results indicate that such switches have long-term stability and show satisfactory performance in amplifying circuits. Dissert. Abstr.

N75-31326 Auburn Univ., Ala.
ON THE IMPLEMENTATION OF REAL TIME DIGITAL FILTERS Ph.D. Thesis
Sajjan Gangappa Shivashankaraiah 1975 143 p
Avail: Univ. Microfilms Order No. 75-18035

The overall process of digital filter implementation starting with a higher-order digital transfer function is discussed. Algorithms to provide a good pole-zero pairing for cascade implementations and a low noise ordering of cascaded modules are provided. The quantization characteristics of twenty structures (programming forms) and a weighted average technique to choose the best structure are presented. The results of several simulations designed to verify these algorithms show the low noise characteristics of the implementation process. Some experimental results are also demonstrated. Dissert. Abstr.

N75-31327 City Univ. of New York.
MICROWAVE METAL-INSULATOR-SEMICONDUCTOR VARACTORS Ph.D. Thesis
Raymond Louis Camisa 1975 222 p
Avail: Univ. Microfilms Order No. 75-17507

The characteristics of metal-insulator-semiconductor (MIS) varactors are studied theoretically and experimentally. A numerical model for the small signal impedance of a one dimensional MIS structure was developed. The solution is valid for nondegenerate semiconductors with arbitrary impurity profiles. The solution proceeds by first solving for the steady state electrostatic potential everywhere in the structure. Laplace's equation is specified in the insulator, Poisson's equation in the semiconductor, and boundary conditions at the ends and interface point. The resulting mathematical formulation is a mixed linear - nonlinear boundary value problem, and a quasilinearization algorithm was used to obtain a numerical solution. Once the electrostatic problem is solved the microwave impedance may be calculated by perturbing the dc solution with a small sinusoidal signal. The basic equations are linearized about the dc operating point resulting in three coupled linear second order differential equations. The sinusoidal steady state problem is set up as a linear boundary value problem which may be solved for without iteration. Dissert. Abstr.

N75-31328 Florida Univ., Gainesville.
NOISE IN BJPOLAR JUNCTION TRANSISTORS AT CRYOGENIC TEMPERATURES Ph.D. Thesis
Thomas Edward Wade 1974 256 p
Avail: Univ. Microfilms Order No. 75-16463

The characterization is presented of the noise performance of modern silicon planar bipolar junction transistors over a temperature spectrum of 60 Kelvin to 300 Kelvin in twelve discrete intervals and for seven different bias conditions. All noise measurements were performed above the 1/f noise frequency region. Several conditions exist in bipolar junction transistors at cryogenic temperatures which allow for accurate testing of conventional theories used to characterize these devices at room temperature. These include a drastic decrease in the dc and ac current amplification factors; increased effects of carrier recombination and trapping in the emitter-base space-charge-region, a large tendency towards high level injection operation (especially for room temperature high gain devices), and a marked decrease in cutoff frequency (at least for double diffused planar devices). Dissert. Abstr.

N75-31329* National Aeronautics and Space Administration. Pasadena Office, Calif.
SUBMINIATURE INSERTABLE FORCE TRANSDUCER Patent
Robert H. Silver (JPL), Gilbert W. Lewis (JPL), Cyril Feldstein (JPL), and Edward N. Duran, inventors (to NASA) (JPL) Issued 16 Sep. 1975 6 p Filed 15 May 1974 Sponsored by NASA (NASA-Case-NPO-13423-1; US-Patent-3,905,356; US-Patent-Appl-SN-470429; US-Patent-Class-128-2S; US-Patent-Class-338-2; US-Patent-Class-73-88.5) Avail: US Patent Office CSCL 09A

A sub-miniature transducer is described which is suitable for measuring forces at a predetermined location within muscle tissue; it includes a small diameter tube with a slit at the lower end that forms a pair of tines, and a strain gauge fixed within the tube to one of the tines for measuring slight deflections of the tine. The tube can be inserted into muscle tissue to measure forces at a location deep within the tissue and with minimal disturbance to the tissue, and the tube can be turned to any orientation to measure forces in different directions.
Official Gazette of the U.S. Patent Office

N75-31330* National Aeronautics and Space Administration. Pasadena Office, Calif.
SYMMETRICAL ODD-MODULUS FREQUENCY DIVIDER Patent
Alexander Engel, inventor (to NASA) (JPL) Issued 16 Sep. 1975 5 p Filed 12 Mar. 1974 Supersedes N74-18869 (12 - 10, p 1145) Sponsored by NASA (NASA-Case-NPO-13426-1; US-Patent-3,906,374; US-Patent-Appl-SN-45053; US-Patent-Class-328-41; US-Patent-Class-307-225R) Avail: US Patent Office CSCL 09A

A frequency divider arrangement is reported that can be used for division by an odd number and which provides a symmetrical output. It comprises an exclusive Or gate followed by a divide by 2N counter where (2N-1) equals the odd number. Input to the exclusive Or gate is from a pulse source and from the counter output.
Official Gazette of the U.S. Patent Office

N75-31331* National Aeronautics and Space Administration. Pasadena Office, Calif.
STORED CHARGE TRANSISTOR Patent
Joseph Maserjian (JPL) and George W. Lewicki, inventors (to NASA) (JPL) Issued 16 Sep. 1975 12 p Filed 25 Aug. 1971 Supersedes N73-30974 (11 - 22, p 2617) Sponsored by NASA (NASA-Case-NPO-11156-2; US-Patent-3,906,296; US-Patent-Appl-SN-174684; US-Patent-Class-357-7; US-Patent-Class-307-238; US-Patent-Class-340-173CA; US-Patent-Class-357-24) Avail: US Patent Office CSCL 09A

A stored charge device of the general type designated as an MNOS field-effect transistor, has its operation improved by embedding a thin metal layer between two insulating films used in the transistor. The embedded metal layer technique is used to provide a two-terminal thin-film stored charge device, consisting of a metal-insulator-embedded-metal-insulator-metal, sandwich structure which can be used in high-density memory arrays.
Official Gazette of the U.S. Patent Office

N75-31332* National Aeronautics and Space Administration. Pasadena Office, Calif.
DOPED JOSEPHSON TUNNELING JUNCTION FOR USE IN A SENSITIVE IR DETECTOR Patent
Melvin M. Saffren, inventor (to NASA) (JPL) Issued 16 Sep. 1975 12 p Filed 19 Mar. 1974 Supersedes N74-20022 (12 - 11 p 1291) Sponsored by NASA (NASA-Case-NPO-13348-1; US-patent-3,906,231; US-Patent-Appl-SN-452770; US-Patent-Class-250-238; US-Patent-Class-250-370; US-Patent-Class-357-5) Avail: US Patent Office CSCL 09A

A superconductive tunneling device having a modified tunnel barrier capable of supporting Josephson tunneling current is provided. The tunnel barrier located between a pair of electrodes includes a molecular species which is capable of coupling incident radiation of a spectrum characteristic of the molecular species into the tunnel barrier. The coupled radiation modulates the known Josephson characteristics of the superconducting device. A superconductive tunneling device can be tuned or made sensitive to a particular radiation associated with the dopant molecular species. Semiconductor material can be utilized as the molecular species to provide an increased selective bandwidth response. Appropriate detector equipment is utilized to measure the modulation of any of the Josephson characteristics such as critical current, voltage steps, Lambe-Jaklevic peaks and plasma frequency. Official Gazette of the U.S. Patent Office

N75-31333 University of South Florida, Tampa.
NOISE AND MICROSCOPIC DEFECTS IN ELECTRON BOMBARDED JUNCTION FIELD EFFECT TRANSISTORS Ph.D. Thesis
Iyengar N. Krishnan 1975 213 p
Avail: Univ. Microfilms Order No. 75-17832

The effects of electron bombardment on the noise in junction field effect transistors (JFETs) were studied, using a 3 MeV van de Graaff accelerator as the source of electron radiation. As the noise in a JFET can be characterized by the short circuit noise resistance, the noise conductance, and correlation conductance, quantitative changes in the values of these parameters, which arise as a result of electron bombardment, were evaluated. This was accomplished by using the pre- and post-irradiation noise figure characteristics at 100 and 600 KHz, measured over a wide range of source resistances from 300 omega to 745 K omega. It is shown by a systematic analysis of the changes in the noise parameters that noise resistance is the most sensitive noise parameter to electron bombardment and this is attributed to a large increase of generation-recombination (g-r) noise in irradiated JFETs. The large increase of g-r noise is confirmed by means of the frequency spectra of noise in irradiated JFETs, which exhibit well defined time

constants, an important characteristic of g-r noise.
Dissert. Abstr.

N75-31334 George Washington Univ., Washington, D.C.
TRANSIENT ANALYSIS OF PHASE-LOCKED LOOPS IN THE PRESENCE OF NOISE Ph.D. Thesis
Henry Ninghan Ho 1975 159 p
Avail: Univ. Microfilms Order No. 75-12617

Transient or time-dependent behavior was studied of phase-locked loops (PLL's) in the presence of noise. The cases of the first order PLL's in the presence of exponentially correlated noise and the second order (lag-filter) PLL's in the presence of white Gaussian noise are considered. For each of the two PLL models above, the corresponding Fokker-Planck equation for the transition probability density of phase error is formulated. In the region of low signal-to-noise ratio perturbation techniques were used to obtain approximate modulo-2pi solutions to the Fokker-Planck equation. These approximate solutions are then used to determine the transition cumulative distribution function, the time dependent mean, and the time dependent variance of phase error. Numerical results which show the transient behavior of the PLL as a function of various loop parameters of interest are presented as tables and figures. Dissert. Abstr.

N75-31335 Florida Univ., Gainesville.
NOISE IN ION IMPLANTED AND DIFFUSED INTEGRATED CIRCUIT RESISTORS Ph.D. Thesis
Kun-Chih Hsieh 1974 113 p
Avail: Univ. Microfilms Order No. 75-16396

In order to aid in optimizing the design of the integrated circuit resistors, the noise of two types of resistors, buried layer resistors and surface layer resistors, was studied experimentally and theoretically, as a function of current, impurity concentration, trap density, junction reverse bias and the dimensions. Traps in the buried layer coupled with ambipolar diffusion and recombination in the transition region are considered to be the noise process in the buried layer resistors. The results are explained with a diffusion noise theory, which in essence is similar to that of MacFarlane and Richardson. Surface states are considered to be the cause of the 1/f noise in the surface layer resistors. A model similar to McWhorter's is used for the theory which can estimate the approximate surface state density. The theoretical noise equations developed can help the design and the processing of these devices. Dissert. Abstr.

N75-31336 Purdue Univ., Lafayette, Ind.
THE INTERNAL DYNAMICS AND MICROWAVE PROPERTIES OF X-BAND TRANSFERRED-ELECTRON DEVICES Ph.D. Thesis
Richard Arthur Kiehl 1974 216 p
Avail: Univ. Microfilms Order No. 75-17228

Numerical calculations and experimental measurements were carried out to determine the internal dynamics and microwave properties of supercritically-doped, n-GaAs transferred-electron devices that have relatively short 10 microns active regions. Internal dynamics and microwave properties related to the oscillatory behavior of the device are considered. Equations describing the internal physics of a device having ohmic contacts and a flat doping profile are solved numerically for their response to X-band, sinusoidal voltage waveforms of various amplitudes. The influence of electron diffusion upon device behavior was investigated by considering several cases of the diffusion coefficient. Internal dynamics and microwave properties related to the amplification and frequency conversion behavior of an oscillating device are considered. Measurements of reflection gain are made for signals injected into a device undergoing circuit-controlled oscillation. Measured gains are used to experimentally determine the ac response of the device at frequencies several gigahertz above its oscillation frequency. Dissert. Abstr.

N75-31337 Arizona Univ., Tucson.
THE DESIGN OF LINEAR ELECTROTHERMAL INTEGRATED CIRCUITS Ph.D. Thesis
Nynand Jakobus Louw 1974 187 p
Avail: Univ. Microfilms Order No. 75-17819

An electrothermal circuit was developed consisting of a silicon integrated chip insulated thermally from its mechanical package. Power was dissipated on the chip by heater circuits, and the resultant temperature variations were sensed by sensor circuits. Designs of circuit layouts which realize approximately single-pole electrothermal transfer functions are given, and experimental results obtained with inductorless, capacitorless, state-variable electrothermal low-pass, high-pass, band-pass, and band-elimination filters are presented. An analysis of the temperature dependence of electrothermal transfer functions is given, and a simple temperature compensation scheme is shown. The problem of thermal cross-coupling between several integrated circuit chips mounted on a common thermally insulating layer was analyzed. Dissert. Abstr.

N75-31338 Florida Univ., Gainesville.
CONDUCTION MECHANISMS IN LOW BREAKDOWN VOLTAGE SILICON p-n JUNCTIONS Ph.D. Thesis
Wieslaw A. Lukaszek 1974 164 p
Avail: Univ. Microfilms Order No. 75-16410

White noise spectra of doides were used to investigate the reverse conduction mechanisms in silicon junctions breaking down by a combination of tunneling and impact ionization multiplication. The reverse voltages at the onset of multiplication noise indicate that, regardless of junction field strengths, carrier multiplication sets in only when the carrier energies exceed the threshold energies for ionization. Further examination of noise data indicates that the multiplication process is dominated by the effects of the threshold energies for ionization. Method of performing dc multiplication calculations and a theory of noise in low breakdown voltage diodes are developed. Dissert. Abstr.

N75-31339# Florida Univ., Gainesville.
MODIFICATIONS OF DRIFT-DIFFUSION TRANSPORT IN THE ANALYSIS OF THIN-BASE TRANSISTORS Ph.D. Thesis
Peter Rohr 1974 39 p
Avail: Univ. Microfilms Order No. 75-16438

An examination was made of the base region of a bipolar transistor, an internal region critical to device performance. A semi-automatic argument is first presented to indicate that, of the set of equations describing the bipolar transistor, the equations for transport by drift and diffusion becomes questionable first with shrinking base width. For the limiting case of small base widths, a simple physical model was proposed that yields the behavior of the various equivalent circuit parameters of the transistor. Comparison then shows that many of these parameters derive less benefit from decreasing base width than conventional theory predicts. To describe behavior intermediate between the two limiting cases of small and large base widths, two approaches are considered. First, the applicability of the Boltzmann transport equation is examined, and certain difficulties are exposed. Second, a physical model is proposed to include the effects of ionic scattering. The model involves various approximations. Each of these is examined in detail. Dissert. Abstr.

N75-31340 Purdue Univ., Lafayette, Ind.
AN ANALYSIS AND CONTROL DESIGN STUDY OF A CURRENT SOURCE INVERTER RELUCTANCE MACHINE DRIVE Ph.D. Thesis
Chee-Mun Ong 1974 178 p
Avail: Univ. Microfilms Order No. 75-17260

Equivalent circuit representations of the current source inverter (CSI) are derived. The steady-state solution of a reluctance machine fed from the CSI is obtained using state variable techniques. Closed-form expressions for the instantaneous and average values of the machine variables are presented. The computed waveforms of these variables are compared with results from an analog simulation in which the inverter and motor are represented. Average and pulsating components of the electromagnetic torque as well as stator and rotor copper losses are calculated from the expressions derived. The stability of the CSI reluctance machine with constant current and constant voltage rectifier modes of operation is investigated using a linearized model of the system. The effects of changes in machine parameters on the transient response of the system is studied. Feedback controls to extend the stable region of operation and to introduce added damping are designed along with regulation of the operating point for optimum performance. Dissert. Abstr.

N75-31341 Texas Univ., Austin.
AN ASSESSMENT OF THE APPLICABILITY OF HIGH VOLTAGE AC CIRCUIT BREAKERS TO INDUCTIVE ENERGY STORAGE Ph.D. Thesis
Robert Bruce McCann 1975 147 p
Avail: Univ. Microfilms Order No. 75-16707

High voltage ac circuit breakers are attractive candidates for the current interrupter in Inductive Energy Storage (IES) systems with energy transfer times of 0.5 to 50 ms. The various types of high voltage circuit breakers are considered, and vacuum circuit breakers are selected as the most desirable for IES applications. In designing the IES circuits, it is assumed that the circuit breakers must be operated within the appropriate 60 Hz ratings. Two IES systems are considered as examples: a fusion feasibility experiment based on a staged theta pinch; and the turbulent heating of a proposed Tokamak fusion feasibility device. An optimization model is developed which considers economic as well as engineering factors in determining the conditions under which ac circuit breakers are applicable to IES. For inductive loads it is found that energy delivery times as short as about 1.0 ms are practical while for resistive loads this might be extended to 500 microns. In either case, the energy transfer time should not be less than twenty times greater than the circuit breaker dionization time. Dissert. Abstr.

N75-31342*# National Aeronautics and Space Administration, Washington, D.C.
ELECTRONIC CIRCUITS AND SYSTEMS: A COMPILATION Technology Utilization
Jan. 1975 30 p
(NASA-SP-5972(02)) Avail: NTIS HC $1.00 CSCL 09C

Technological information is presented electronic circuits and systems which have potential utility outside the aerospace community. Topics discussed include circuit components such as filters, converters, and integrators, circuits designed for use with specific equipment or systems, and circuits designed primarily for use with optical equipment or displays. Author

N75-31343*# Technovators, Silver Spring, Md.
QUASI-ISOTROPIC VHF ANTENNA ARRAY DESIGN STUDY FOR THE INTERNATIONAL ULTRAVIOLET EXPLORER SATELLITE Final Report
Jeremy K. Raines 18 Jul. 1975 104 p refs
(Contract NAS5-22364)
(NASA-CR-144663) Avail: NTIS HC $5.25 CSCL 09C

Results of a study to design a quasi-isotropic VHF antenna array for the IUE satellite are presented. A free space configuration was obtained that has no nulls deeper than -6.4 dbi in each of two orthogonal polarizations. A computer program named SOAP that analyzes the electromagnetic interaction between antennas and complicated conducting bodies, such as satellites was developed. Author

N75-31344*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A NEW BROADBAND SQUARE LAW DETECTOR
M. S. Reid, R. A. Gardner, and C. T. Stelzried 1 Sep. 1975 19 p refs
(Contract NAS7-100)
(NASA-CR-143459; JPL-TR-32-1599) Avail: NTIS HC $3.25 CSCL 09C

A broadband constant law detector was developed for precision power measurements, radio metric measurements, and other applications. It has a wide dynamic range and an accurate square law response. Other desirable characteristics, which are all included in a single compact unit, are: (1) high-level dc output with immunity to ground loop problems; (2) fast response times; (3) ability to insert known time constants; and (4) good thermal stability. The detector and its performance are described in detail. The detector can be operated in a programmable system with a ten-fold increase in accuracy. The use and performance of the detector in a noise-adding radiometer system is also discussed. Author

N75-31345*# Kanner (Leo) Associates, Redwood City, Calif.
RECORDING OF THE POLAROGRAPHIC 'REDOX WAVE' ON A STATIONARY ELECTRODE BY CYCLIC VOLTAMMETRIC METHOD
Gy. Farsang and L. Tomcsanyi Washington NASA Sep. 1975 12 p refs Transl. into ENGLISH from Magy. Kem. Folyoirat (Hungary), v. 72, no. 3, 1966 p 136-139
(Contract NASw-2790)
(NASA-TT-F-16548) Avail: NTIS HC $3.25 CSCL 09C

Application of the cyclic voltammetric method (cyclic voltage sweep chronoamperometry) was investigated. The method of recording the current type known in polarography as redox wave on a stationary electrode was developed by cyclic polarization. The analytical applicability of the method was examined. The validity of redox potential values that can be measured on a carbon paste electrode was proven by potentiometric measurements. On the basis of the favorable results, use of the carbon paste electrode as an indicator electrode is suggested in the field of voltammetric and potentiometric end-point indication. Author

N75-31346*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN AND DEVELOPMENT OF A 5 kV ISOLATED SOLID STATE SWITCH
R. J. Holbrook (Hughes Aircraft Company, Culver City, Calif.), R. Y. Scapple (Hughes Aircraft Company, Culver City, Calif.), F. Z. Keister (Hughes Aircraft company, Culver City, Calif.), and S. T. Gooder Feb. 1975 11 p Presented at the 25th Electron. Components Conf.
Avail: NTIS HC $3.25 CSCL 09C

A unique microcircuit intended for use as a shorting switch for large extraterrestrial solar cell arrays is described. The packaging design for the 5 kV isolated hybrid switch is different from most hybrid microcircuits in that it utilizes a compartmentalized plastic case (a portion of which is encapsulated), is not hermetic, and is designed for high voltage operation. Author

N75-31347# AEG-Telefunken, Ulm (West Germany). Fachbereich Roehren.
CATHODE RAY TUBES OF HIGH RESOLUTION Final Report, 1 Apr. 1971 - 31 Dec. 1972 [HOCHAUFLOESENDE ELEKTRONENSTRAHLROEHREN]
P. Schackert and P. Beisse Bonn Bundesmin. fuer Forsch. u. Technol. Apr. 1975 50 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-75-03) Avail: NTIS HC $3.75; ZLDI, Munich DM 10.50

Flying spot tubes of high resolution and high brightness were developed. At first an appropriate electron gun was designed which is characterized by a small crossover of high electron density. Extensive investigations were made in order to minimize the spread of the focused electron beam within the phosphor layer. The application of phosphors of a fine crystal-structure deposited by a cataphoretic technique proved the best process. At the same time the preparation of floated foils had to be optimized before the evaporation of an aluminum layer could be made. At a drive pulse of 20 V and a beam current of 15 micro A a resolution of 13 microns was achieved measured with a two-slit analyzer. Author (ESRO)

N75-31348# AEG-Telefunken, Heilbronn (West Germany). Fachbereich Halbleiter.
FREQUENCY MULTIPLIER 0.1/12 GHz WITH MOS VARACTORS [FREQUENZVERVIELFACHER 0,1/12 GHz MIT MOS-VARAKTOREN]
Dieter Fritzsche and Harshavadan Shah Bonn Bundesmin. fuer Forsch. u. Technol. Apr. 1975 47 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-RFT-2071; GFW-RV-11-TI-4/71)
(BMFT-FB-W-75-02) Avail: NTIS HC $3.75; ZLDI, Munich DM 9.90

Development of a 0.1/12-GHz frequency multiplier with MOS-varactors is summarized. Design data for a quartz-stabilized injection locking source for a Gunn-oscillator were obtained. The MOS-varactor technology was improved and reliability tests were carried out. Three types of MOS-varactors were developed and tested in different multiplier circuits. Results led to the system design of a three stage 0(1/12)-GHz multiplier with an output power of 5 mW at 12 GHz and a minimum efficiency of 2.4. Author (ESRO)

N75-31349# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.

DEVELOPMENT OF NEW TECHNOLOGIES IN THE 100 GHz RANGE Final Report [ENTWICKLUNG NEUER TECHNOLOGIEN IM 100 GHz-BEREICH]

Erich Glass, Juergen Hammerschmitt, and Karl-Heinz Zschauer Bonn Bundesmin. fuer Forsch. u. Technol. Apr. 1975 91 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.

(BMFT-FB-T-75-04) Avail: NTIS HC $4.75; ZLDI, Munich DM 19.15

For the spectroscopic investigation of air pollution by combustion exhaust gases, solid state oscillators in the 100 GHz range were developed. Two different approaches were pursued: Fabrication of GaAs IMPATT diodes for straight operation at 100 GHz, and Si IMPATT diodes for 33 to 50 GHz with frequency trebling or doubling, and subsequently also for 100 GHz. The doping of the space charge layer height, and diameter are given for both Si - and GaAs diodes. In both frequency ranges resonators and a suitable contacting of the diodes were developed. Between 33 and 50 GHz a maximum output power of 7 mW, near 100 GHz one of 0.2 mW was obtained. The efficiency was 0.23 and 0.004%, respectively. The noise of the GaAs diodes was much lower. For a quick frequency variation of the oscillator magnetically tunable resonators with low magnetic fields were also constructed. Author (ESRO)

N75-31350# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.

EFFECTS OF SHADOWS ON PHOTOCURRENT-COMPENSATED INTEGRATED CIRCUITS Interim Report

Robert H. Vandre 22 Apr. 1975 27 p refs

(Contract F04701-74-C-0075)

(AD-A009841; TR-0075(5250-30)-1; SAMSO-TR-75-114) Avail: NTIS CSCL 09/5

Simple calculations show that high-z components, such as wires, capacitors, and solder bonds, can easily cast shadows with edges only 25-micrometers wide when illuminated with a low-energy (E - 60 keV) X-ray beam. If one of these shadows falls between a photocurrent-compensating diode-transistor pair, the mismatch in dose can drastically reduce the transient hardness of the integrated circuit. Results of pulsed X-ray tests on the Texas Instruments RSN 54L 71 R-S flip-flop and RSN 54L 00 quad two-input nand gate showed that the upset threshold of a given state of the flip-flop was lowered by as much as a factor of 29 and the nand gate by a factor of 5.7. GRA

N75-31351# Army Materiel Command, Texarkana, Tex. Intern Training Center.

A FEASIBILITY STUDY OF GROUND FAULT INTERRUPTERS Final Report

Robert Elwood DeHart, II Apr. 1975 79 p refs

(AD-A009315; USAMC-ITC-02-08-75-406) Avail: NTIS CSCL 09/1

With continual emphasis on safety in domestic and industrial American life today, many new safety innovations have been introduced on the market. One such device that has recently become available is the ground fault interrupter. This device simply monitors the current flowing to a device; and, if the leakage current to ground exceeds a pre-determined value, the GFI interrupts the flow of current to the load by tripping the circuit. The paper presents the conventional methods protecting individuals from electrical shock - overcurrent protection devices (circuit breakers and fuses), equipment grounding (3-pronged safety plugs), and double insulation. GFIs are able to detect the small amount of leakage current that the conventional methods cannot measure, and the bulk of the paper deals with these devices. In order that the reader may have some insight to the effect of electrical shock on the human body, a discussion of man's physiological response to shock is also presented. GRA

N75-31352# Army Materiel Command, Texarkana, Tex. Intern Training Center.

A SURVEY OF COMPUTER AIDED ELECTRONIC CIRCUIT ANALYSIS PROGRAMS Final Report

Soo Young Shin Mar. 1975 76 p refs

(AD-A009185; USAMC-ITC-02-08-75-220) Avail: NTIS CSCL 09/5

This report is the result of a survey on a few computer-aided electronic circuit analysis programs. The characteristic features and analysis capabilities of each program are discussed in detail. The common aspects among the programs are tabulated for easy comparison. The actual computer program executions of two example circuit networks are included. The programs surveyed are ECAP, ECAP-II, CIRCUS, CIRCUS II, SCEPTRE, ASTRAP, BELAC, SYSCAP, CORNAP and SCAP. GRA

N75-31353# Michigan Univ., Ann Arbor. Electron Physics Lab.

PROPERTIES OF AVALANCHE TRANSIT-TIME DEVICES, VOLUME 1 Ph.D. Thesis

C. M. Lee Mar. 1975 288 p refs

(Contracts F30602-74-C-0012; AF Proj. 5573)

(AD-A009041; TR-132-Vol-1; RADC-TR-75-20-Vol-1) Avail: NTIS CSCL 09/1

The objectives of this study are two-fold. One is to develop a very general large-scale computer simulation model for semiconductor devices. The other is to simulate various Si avalanche diode structures operating in the IMPATT and TRAPATT modes at different operating conditions in order to investigate the effects of various parameters on the performance of these avalanche diodes. GRA

N75-31354# Michigan Univ., Ann Arbor. Electron Physics Lab.

PROPERTIES OF AVALANCHE TRANSIT-TIME DEVICES, VOLUME 2 Ph.D. Thesis

C. W. Lee Mar. 1975 334 p refs

(Contract F30602-74-C-0012; AF Proj. 5573)

(AD-A009042; TR-132-Vol-2; RADC-TR-75-20-Vol-2) Avail: NTIS CSCL 09/1

An extensive simulation of the IMPATT mode of operation of two X-band Read-type diodes, ten X-band low-high-low diodes, four X-band one-sided abrupt diodes and two K-band realistic p-n junction diodes had been conducted for different bias current densities, frequencies, RF voltages and temperatures. The effects of various device parameters and operating conditions on diode performance have been investigated and discussed. A set of general guidelines for designing Si IMPATT diodes is presented. Simulations have also been done for the TRAPATT mode of operation of fourteen Si avalanche-diode structures at different frequencies and bias current densities. Effects of various device parameters and operating conditions on RF performance have been studied and discussed. GRA

N75-31355# Massachusetts Inst. of Tech., Cambridge.

AN EFFICIENT ALGORITHM FOR THE DESIGN OF EQUIRIPPLE TWO-DIMENSIONAL FIR DIGITAL FILTERS

R. M. Mersereau, D. B. Harris, and H. S. Hersey Apr. 1975 7 p refs

(Contract N00014-67-A-0204-0064; NR Proj. 049-328)

(AD-A009255; LC-73-86306) Avail: NTIS CSCL 09/2

An efficient algorithm is presented for performing optimal Chebyshev approximation in the absence of the Haar condition. It has been successfully used in the design of two-dimensional FIR low-pass filters with and without symmetry constraints in the impulse response and also in the design of special classes of one-dimensional FIR filters with impulse response constraints such as interpolation filters. GRA

N75-31356# Kentucky Univ., Lexington.

SCEPTRE MODELS OF A PULSE FORMING SYSTEM

Ronald J. Kuhler and Victor J. Watson Mar. 1975 35 p

(Contract F30602-72-C-0418; AF Proj. 9567)

(AD-A009175; RADC-TR-75-69) Avail: NTIS CSCL 09/5

Work performed in the generation and testing of the pulse forming network SCEPTRE model is discussed with emphasis upon attempts to determine the pulse forming network element stressing factors under conditions of specific fault occurrences: pulse transformer failure via secondary short or load short; secondary open; and pulse forming network capacitance short. When the generator model is available, the composite system can be simulated to determine the result of transient and fault conditions on the overall network operation. GRA

N75-31357# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
PRODUCTION ENGINEERING MEASURES, VAPOR PHASE COOLED TRAVELING-WAVE TUBES Quarterly Progress Report, 1 Sep. - 1 Dec. 1974
David B. Giguere Dec. 1974 15 p refs
(Contract DAAB05-72-C-5863)
(AD-A009589; EDD-W-05231; QPR-10) Avail: NTIS CSCL 09/1

The report describes the work performed during the tenth quarter of the 636H TWT production engineering measures program. The accomplishments of this quarter included the incorporation of design modifications into the fifth tube, the initiation of a conceptual study for a new packaging configuration, and further electrical testing of the fourth TWT. GRA

N75-31358# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.
METHOD OF MOMENTS APPLICATIONS. VOLUME 6. MATRIX METHODS FOR STATIC MICROSTRIP Phase Report, Jul. 1973 - Sep. 1974
A. Farrar and A. T. Adams Feb. 1975 166 p refs
(Contract F30602-72-C-0360; AF Proj. 4540)
(AD-A009637; RADC-TR-73-217-Vol-6) Avail: NTIS CSCL 09/1

Matrix methods are applied to static microstrip problems and used to deduce the approximate propagation characteristics of the dominant, quasi-TEM mode. Three basically different techniques are employed, in conjunction with the matrix methods. The first uses a free space Green's function, the second uses multiple imaging to obtain a Green's function for single substrate microstrip, and the third uses Fourier integral methods to obtain the Green's function for multilayered and/or covered microstrip. Several classes of problems are treated. The capacitance matrix, propagation constant, and characteristic impedance are obtained for two-dimensional (transmission line) problems. In addition, a general method for treating capacitive discontinuities in microstrip is developed and applied to typical three-dimensional discontinuity problems such as an open circuit, a gap in microstrip, and a sudden change in width of microstrip. Finally, multilayered and covered microstrip propagation is analyzed by a Fourier integral method. GRA

N75-31359# Army Foreign Science and Technology Center, Charlottesville, Va.
TRANSFORMER OF ELECTRICAL IMPULSES
S. I. Grushin and A. S. Lushtak 23 May 1974 6 p Transl. into ENGLISH from Russian Patent no. 308556
(AD-A009346; FSTC-HT-23-0129-74) Avail: NTIS CSCL 09/1

The transformer excludes multiple signal discharges at the output in the case of the introduction of a single signal at the input. This is done by adding a second resistance-capacitance circuit at the input. This modification facilitates the reception of coded transmissions in the presence of high frequency interferences. GRA

N75-31360# Army Foreign Science and Technology Center, Charlottesville, Va.
FORMATION OF THE EXCAVATOR CHARACTERISTICS OF A FREQUENCY-REGULATED ASYNCHRONOUS ELECTRIC DRIVE
G. V. Sokolov 17 Jun. 1974 18 p refs Transl. into ENGLISH from Elektromagnit. Protsessy v Privod. s Chastot. Upravl. (Leningrad), 1972 p 89-100
(AD-A009348; FSTC-HT-23-424-74) Avail: NTIS CSCL 09/3

General requirements for excavator characteristics are presented. Equations are derived for excavator curves, based on frequency control by IR compensation and control with constant rated rotor frequency. The latter control principle is preferred with respect to space factor, total power losses and simplicity of accomplishing feedback. GRA

N75-31361# Army Foreign Science and Technology Center, Charlottesville, Va.
GENERATOR WITH DIRECT EVAPORATIVE COOLING
V. I. Naumenko and V. A. Mochalov 5 Jun. 1974 18 p refs Transl. into ENGLISH from Elektrotekhnika (USSR), no. 5, 1968 p 10-14
(AD-A009349; FSTC-HT-23-409-74) Avail: NTIS CSCL 10/2

The design of an electrical machine with high intensity evaporative cooling is described. Experimental data and relationships describing the process of cooling the machine, taking account of the effect of external conditions, are presented. The basic calculation of the cooling system is reported. GRA

N75-31362# Naval Postgraduate School, Monterey, Calif.
THE POWER LINE DISTURBANCE MONITOR: A CASE STUDY OF THE NAVY'S CONTINUING EFFORTS IN THE FIELD OF TECHNOLOGY TRANSFER M.S. Thesis
Edward Harry Tempest and Lester Arthur VanRooy, Jr. Mar. 1975 28 p refs
(AD-A009908; NPS-55J075031) Avail: NTIS CSCL 09/3

The paper presents a case study of the successful attempt of a Navy research laboratory to participate in technology transfer. Background information concerning the Defense Department's research and development budget along with Defense and Navy policy regarding technology transfer is provided. The aggressive technology transfer program devised and implemented by the Navy's Civil Engineering Laboratory is discussed. The development of a power line disturbance monitor and its inclusion into the laboratory's technology transfer program are traced. An assessment of the benefits that accrued to both the public and private sectors of the economy, as a result of this particular project, is made. GRA

N75-31363# Naval Research Lab., Washington, D.C.
LOW ELECTRICAL FIELD CHARACTERISTICS OF PIEZOELECTRIC CERAMIC RINGS, PART 2 Interim Report
S. W. Meeks and R. W. Timme 1 May 1975 24 p refs
(AD-A009768; NRL-7891) Avail: NTIS CSCL 17/1

Low electrical field parameters of Type I piezoelectric ceramic rings purchased from four major suppliers of sonar ceramic elements were measured to determine the applicability and value of MIL-STD-1376(SHIPS), Piezoelectric Ceramic for Sonar Transducers. Data are also presented on two recently developed low-aging compositions. Measured values of the relative dielectric constant, loss tangent, electromechanical coupling factor, frequency constant, mechanical Q sub m, elastic compliance coefficient, and piezoelectric constants at low electrical fields and as functions of temperature (0 to 50C) and aging are presented. The samples of Type I ceramic showed some improvement toward satisfying all the specifications of MIL-STD-1376(SHIPS) over those previously measured. The low-aging compositions are characterized as a function of temperature and are shown to be similar to the Type I composition. GRA

N75-31364# Microwave Associates, Inc., Burlington, Mass.
PRODUCTION ENGINEERING MEASURE FOR LOW NOISE SOLID-STATE OSCILLATOR Quarterly Report, 19 Nov. - 19 Aug. 1973
Howard Epstein, D. Higgs, T. B. Ramachandran, and Robert E. Walline Jan. 1974 33 p
(Contract DAAB05-72-C-5861)
(AD-A009777; ECOM-5861-6-72; QR-6) Avail: NTIS CSCL 09/1

The power, efficiency and operating frequency specifications can be met over a wide range of breakdown voltage IMPATT diodes. The AM noise figure appears to be the most critical diode specification and the higher breakdown voltage diodes appear to give superior performance. Diode reliability for the IMPATT diodes is a serious problem and degradation with subsequent failure is the norm. A prototype oscillator was assembled. This oscillator met power output, electronic tuning, frequency pulling and pushing and power pushing. The oscillator failed to meet the specifications of AM noise and power pulling. GRA

N75-31365# Aerospace Corp., El Segundo, Calif.
SCANNING ELECTRON MICROSCOPE IRRADIATION OF MOS CAPACITORS Technical Report, 1 Oct. 1973 - 1 Jun. 1974
M. F. Millea and D. A. McPherson 1 Nov. 1974 45 p refs
(Contract F04701-74-C-0075)
(AD-A009655; TR-0075(5124)-1; SAMSO-TR-75-109) Avail: NTIS CSCL 09/1

The objective of this program was to characterize radiation effects induced in electronics when exposed to an electron beam from a scanning electron microscope (SEM). An MOS capacitor was chosen as the test object, because radiation effects on MOS capacitors are well known. The effects of radiation on the capacitors were characterized by the variation in the capacitance-voltage characteristic with radiation dose. It was found that the change in flat-band voltage shift for a given radiation dose is similar for both SEM radiation and Co60 radiation. A technique was developed for annealing out radiation-induced damage in MOS capacitors by irradiating at negative gate bias, and then heating the capacitors at an elevated temperature. This process permits the same device to be calibrated and used as a radiation monitor or to be used as a test device for radiation studies. Several interesting applications of the SEM became apparent. One of these is the capability to study lateral nonuniformities in electronic circuits. GRA

N75-31366# Michigan Univ., Ann Arbor. Electron Physics Lab.
MICROWAVE SOLID STATE DEVICE AND CIRCUIT STUDIES Interim Technical Report, 1 Mar. - Sep. 1974
G. I. Haddad Mar. 1975 102 p refs
(Contract F30602-74-C-0012; AF Proj. 5573)
(AD-A009642; Rept-012128-3/4; RADC-TR-75-72) Avail: NTIS CSCL 09/1

This is the third and fourth quarterly progress report on subject contract whose objectives are to investigate theoretically and experimentally new solid-state phenomena and techniques having application to microwave generation, amplification, and control. Tasks under this program are: Properties of IMPATT Diodes, Properties of TRAPATT Diodes, Field-Effect Transistors, Field-Effect Transistor Fabrication, IMPATT Diode Amplifiers and Experiments on TRAPATT Diodes. GRA

N75-31367# Teledyne MEC, Palo Alto, Calif.
PRODUCTION ENGINEERING MEASURE FOR HIGH POWER TRAVELING-WAVE TUBES Quarterly Progress Report
Russell Mills Jan. 1975 17 p
(Contract DAAB05-72-C-5846)
(AD-A009531; QPR-8) Avail: NTIS CSCL 09/1

Work in the program to develop the industrial manufacturing capability to produce 100-watt, Ku-band, helix-type traveling-wave tubes using samarium cobalt magnets is reported. The following subjects are covered: Fabrication and testing of first-article tubes; Revised schedule (Critical Path Method). GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N75-31368 Purdue Univ., Lafayette, Ind.
A THEORY OF THERMOELASTICITY WITH MICROSTRUCTURE Ph.D. Thesis
Ming-Tsan Weng 1974 110 p
Avail: Univ. Microfilms Order No. 75-17298

With the application of a displacement-temperature variational principle, a mathematical theory of thermoelastic composites with cellular micro-element structure was derived. Equations of motion and heat transfer were formulated with associated boundary conditions. Constitutive equations were determined and the field equations were then expressed in terms of the displacement and the temperature variables. A theory of thermoelastic plate with microstructure and micro-temperature was established for the plane stress and the plane strain cases. Boundary value problems were solved for a semi-infinite micropolar plate simply supported on two edges and subjected to a suddenly applied constant heat flux on one face. The theory presented appears to be simpler and more practical than the more general theories of Wozniak and Grot. Dissert. Abstr.

N75-31369 Purdue Univ., Lafayette, Ind.
A STUDY OF THE INTERMITTENT REGION OF A HEATED TWO DIMENSIONAL PLANE JET Ph.D. Thesis
Peter Edwin Jenkins 1974 240 p
Avail: Univ. Microfilms Order No. 75-17216

The conditioned velocity and temperature profiles in a plane jet of air were measured. The conditional point averages of the mean temperature and velocity, the shear stress, and the temperature-velocity correlation were found with respect to the moving interface for three intermittencies. The turbulent transport coefficients for heat and momentum were determined for the fully turbulent flow field at various axial stations. Using these conditional transport coefficients the turbulent Prandtl number was found to be essentially constant across the fully turbulent region of the jet. A model, based on constant transport coefficients, was proposed. The results confirms the value of the turbulent Prandtl number obtained from the experimental profiles. The velocity and temperature intemittencies were found at several axial stations. The intermittency profiles appear similar at different axial stations as do the frequencies of interface crossing. The point average temperature and velocity profiles show a coincidence at the interface with the temperature profile flatter than the velocity profile. Dissert. Abstr.

N75-31370 Drexel Univ., Philadelphia, Pa.
A TWO DIMENSIONAL UNSTEADY FLUID FLOW ANALYSIS BY THE METHOD OF CHARACTERISTICS Ph.D. Thesis
Arthur Stuart Warnock 1975 123 p
Avail: Univ. Microfilms Order No. 75-18079

A computer code for solving two dimensional, unsteady, inviscid, fluid flow problems was developed. Details are presented of the method-of-characteristics formulation, the treatment of the boundary conditions, and the numerical solution technique. In a sample problem of a cylindrical blast wave, the error compared to the exact solution is less than 0.05% at all points after 50 times planes of calculation. In a sample problem of a stream turbine blade, its geometry is approximated so that it is a flat plate problem. The resulting steady state flow shows a two dimensional effect around the blade's leading edge, while the flow becomes one-dimensional at the blade's trailing edge. In addition, the results show that the total pressure remains constant everywhere in the flow, leading credence to the mathematical formulation and the computer code. Dissert. Abstr.

N75-31371 Drexel Univ., Philadelphia, Pa.
MASS, MOMENTUM AND HEAT TRANSFER FROM A FALLING FILM TO A COUNTERCURRENT AIR STREAM Ph.D. Thesis
Vijay Chandra 1975 114 p
Avail: Univ. Microfilms Order No. 75-18042

Simultaneous mass, momentum and heat transfer rates from a vertical falling liquid film to an upward flow of air are reported. Air formed a laminar external boundary layer along the liquid film. The dimensionless transport coefficients were determined from property gradients measured at the inner edge of the vapor boundary layer. The velocity, temperature and vapor mole fraction profiles were measured using hot wire anemometric, thermocouple probe and isokinetic sampling with gas chromatographic analysis techniques. The transport phenomena were studied on two different types of countercurrent liquid films: (1) slow moving nonrippling film and (2) fast moving rippling film. The particular numerical and integral solutions of boundary layer equations are in good agreement with data. Differences between the predicted and measured transport coefficients are shown to be attributed to ripples. Dissert. Abstr.

N75-31372 Purdue Univ., Lafayette, Ind.
A MATHEMATICAL THEORY OF VISCOUS FLUIDS WITH MICROSTRUCTURE AND MICROTEMPERATURE Ph.D. Thesis
Richard Drury Cook 1974 208 p
Avail: Univ. Microfilms Order No. 75-17173

The flow of a simple micromorphic fluid in the presence of microtemperatures is examined. The necessary field equations and jump conditions are derived for this class of fluids. General expressions are presented for moments of arbitrary degree of the equations: conservation of mass, conservation of momentum,

and conservation of energy. The consequences of the second law of thermodynamics as it pertains to the fluid is considered. The appropriate constitutive variables are determined, and a quadratic constitutive theory in these variables is then developed. The theory is further simplified with the application of the Clausius-Dehem inequality, which imposes constraints upon the constitutive constants. The resulting model is then used for parametric studies of flow fields of several simple configurations. Dissert. Abstr.

N75-31373 Texas Univ., Austin.
FINITE ELEMENT ANALYSIS OF VISCOUS, INCOMPRESSIBLE FLUID FLOW Ph.D. Thesis
David Keith Gartling 1975 114 p
Avail: Univ. Microfilms Order No. 75-16673

A numerical procedure was developed for the analysis of general two dimensional flows of viscous incompressible fluids using the finite element method. The partial differential equations describing the continuum motion of the fluid were discretized using a Galerkin procedure in conjunction with the finite element approximation. The isoparametric families of quadrilateral and triangular finite elements were used to represent the dependent variables of the problem. Within each element the velocity fields were approximated with quadratic functions and the pressure represented with linear functions. The nonlinear algebraic equations resulting from the discretization process were solved using a Picard iteration technique. Several computational procedures were developed that allowed significant reductions to be made in the computational effort required for the analysis of many flow problems. The computational methods described were integrated into a computationally efficient, user oriented computer programs. Dissert. Abstr.

N75-31374 Florida Univ., Gainesville.
DISPERSIVE MASS TRANSPORT IN OSCILLATORY AND UNIDIRECTIONAL FLOWS Ph.D. Thesis
Robert Bruce Taylor, III 1974 160 p
Avail: Univ. Microfilms Order No. 75-16455

Four sets of boundary value problems for the equations of fluid motion and transport diffusion were solved to obtain expressions for the spatial variations of velocity and concentration in free surface flows. The four problems investigated treat unidirectional and oscillatory uniform shear flows in rectangular channels of infinite and finite width. The solutions were used to determine longitudinal dispersive mass transport. Analytical expressions for the longitudinal dispersion coefficient associated with infinitely wide channels are presented as functions of the temporal and spatial maximum of velocity, channel depth, period of oscillation (oscillatory flow only), and depth mean vertical coefficient of eddy diffusivity. For channels of finite width, analytical expressions for the longitudinal dispersion coefficient are presented as functions of the temporal and spatial maximum of velocity, channel depth, channel width, period of oscillation (oscillatory flow only), and cross-sectional mean values of vertical and lateral coefficients of eddy diffusivity. Dissert. Abstr.

N75-31375 Columbia Univ., New York.
TRANSPORT PROPERTIES OF REAL GASES Ph.D. Thesis
Ming-Whe Hsieh 1974 147 p
Avail: Univ. Microfilms Order No. 75-16120

Theoretical as well as semi-empirical approaches were used by a number of investigators for the interpretation, correlation, and prediction of transport properties of pure gases and gaseous mixtures. Using a theoretical approach, the Kihara potential was applied to describe the behavior of nonpolar systems. Numerical calculations of the collision integrals in terms of the Kihara potential were carried out. Satisfactory results were obtained in the prediction of viscosities and binary diffusivities of gaseous systems at low pressures. For polar systems at low pressures, the preaveraged potential model developed by Rowlinson and by Danon and Amdur was used to correlate viscosity and binary diffusivity data. Satisfactory results were also obtained. For polar systems at high pressures, the chemical association theory was extended to account for the anomalous pressure dependence of the viscosity. Experimentally, binary diffusivities of nitrogen-methane and nitrogen-methyl chloride were determined between 25 and 110 C using a modified Stefan diffusion cell. Dissert. Abstr.

N75-31376 North Carolina State Univ., Raleigh.
ANALYSIS OF A WALL-STABILIZED-ARC DISCHARGE WITH THREE-DIMENSIONAL, NON-GREY RADIATION TRANSPORT Ph.D. Thesis
Gerald David Walberg 1974 214 p
Avail: Univ. Microfilms Order No. 75-17087

A new theoretical analysis of a wall-stabilized arc discharge is developed, used to calculate distributions of enthalpy, velocity and pressure for a wide range of arc operating conditions, and used to assess the ability of a test facility which employs such an arc as a radiation source (the NASA Langley Planetary Entry Radiation Facility) to produce a radiation intensity spectrum similar to that from the stagnation region shock layer of a planetary-return reentry vehicle. This analysis accounts for three-dimensional radiation transport within the arc and considers a nongrey, self-absorbing real gas (air) in chemical and thermodynamic equilibrium. The governing fluid mechanical equations are solved by employing a multistrip integral method with velocity and enthalpy distributions approximated by second-order polynomials. Dissert. Abstr.

N75-31377 Denver Univ., Colo.
INTERNAL GRAVITY WAVES GENERATED BY A MOVING SOURCE IN A STRATIFIED FLUID Ph.D. Thesis
Robert Dale Mager 1975 93 p
Avail: Univ. Microfilms Order No. 75-16807

The internal gravity wave system produced by a moving source located in a stratified fluid is examined. The stratification of the fluid is exhibited through a vertical variation in the Brunt-Vaisala frequency and through a vertical shear in the transverse ambient flow. The problem is described in terms of a system of partial differential equations for the motion of the fluid. The solution technique is based on an application of a multi-dimensional Fourier transform in the time and transverse spacial variables. This results in a system of transform equations, which are reduced to a single second-order ordinary differential equation for the transform of the vertical velocity component. The inverse transform is then evaluated using the method of multi-dimensional stationary phase, yielding a rigorous asymptotic solution. An alternative formal method of asymptotic solution, based on ray method techniques for hyperbolic partial differential equations, is also performed, and the results are shown to agree with the rigorous solution. Dissert. Abstr.

N75-31378*# New York Univ., N.Y. ERDA Mathematical and Computing Lab.
ACCELERATED ITERATION SCHEMES FOR TRANSIONIC FLOW CALCULATIONS USING FAST POISSON SOLVERS
Antony Jameson Mar. 1975 20 p refs Sponsored in part by ERDA
(Grants NGR-33-016-167; NGR-33-016-201)
(NASA-CR-143431; COO-3077-82) Avail: NTIS HC $3.25 CSCL 20D

The use of a fast elliptic solver in combination with relaxation is presented as an effective way to accelerate the convergence of transonic flow calculations, particularly when a marching scheme can be used to treat the supersonic zone in the relaxation process. Author

N75-31379*# Kent State Univ., Ohio.
TRANSPORT OF TRACE CONTAMINANTS THROUGH POROUS MEDIA Semiannual Status Report, 16 Mar. - 15 Sep. 1975
Richard Madey 15 Sep. 1975 31 p refs
(Grant NsG-2013)
(NASA-CR-143432; KSUPD-TR-75-4; SASR-3) Avail: NTIS HC $3.75 CSCL 20D

Research accomplishments in the following areas are discussed: (1) the calibration of the gas chromatograph for acetaldehyde and ethanol; (2) the development of data reduction and analysis methods; (3) the generation and analysis of experimental data for the transport of 100 ppm acetaldehyde through a cylindrical bed packed with activated carbon granules; (4) the generation and analysis of experimental data for the transport of 100 ppm ethanol through a cylindrical bed packed with activated carbon granules; and (5) a comparison of the volume adsorption capacity of activated carbon for 100 ppm

concentrations of acetaldehyde, ethanol, and acetone. Activities in progress and planned activities are reviewed. Author

N75-31380*# Illinois Univ., Chicago. Dept. of Energy Engineering.
TURBULENT CHEMICALLY REACTING FLOWS ACCORDING TO A KINETIC THEORY Ph.D. Thesis
Zuu-Chang Hong Aug. 1975 150 p refs
(Grant NsG-1150)
(NASA-CR-143453; TRE-75-9) Avail: NTIS HC $5.75 CSCL 20D

A review of various methods of calculating turbulent chemically reacting flow such as the Green Function, Navier-Stokes equation, and others is presented. Nonequilibrium degrees of freedom were employed to study the mixing behavior of a multiscale turbulence field. Classical and modern theories are discussed. J.R.T.

N75-31381*# Kanner (Leo) Associates, Annapolis, Md.
INFLUENCE OF A COMPLIANT SURFACE ON THE CHARACTERISTICS OF TURBULENT FLOW
A. P. Teslo and V. Ye. Filipchuk Washington NASA Sep. 1975 10 p refs Transl. into ENGLISH from Gidromekhanika (USSR), no. 29, 1974 p 45-50
(Contract NASw-2990)
(NASA-TT-F-16555) Avail: NTIS HC $3.25 CSCL 20D

The influence of elastic coatings of inner tube walls on the characteristics of turbulent flow was studied experimentally. A decrease by 25 percent in the drag coefficient for water flowing through polyethylene coated pipes as compared to rigid pipes is established for a Reynolds number of 40,000. The opposite effect was found for air flows at the same Reynolds number. The distribution of the pulsations of the longitudinal velocity component, measured with a hot-wire anemometer in air flow, correlates well with the behavior of the drag coefficient. Author

N75-31382*# Kanner (Leo) Associates, Redwood City, Calif.
INTERACTION BETWEEN A SHOCK WAVE AND A VORTEX
M. Merle, J. P. Fragassi, N. Nahhas, and B. Carbone Washington NASA Sep. 1975 6 p Transl. into ENGLISH from paper Jugoslovensko Drustvo za Mehaniku (Ohrid), 1974 Presented at the 12th Yugoslav Congr. of Rational and Applied Mech., Ohrid, Yugoslavia, 3-8 Jun. 1974
(Contract NASw-2790)
(NASA-TT-F-16575) Avail: NTIS HC $3.25 CSCL 20D

Experimental investigations of the interaction between a shock wave and a vortex were made in a large shock tube. High-speed schlieren photography made it possible to observe the evolution of the phenomena. The theoretical discussion considers the general problem of the interaction between a discontinuity and any type of perturbation. Author

N75-31383*# Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF A NUMERICAL PRESSURE MEASUREMENT SYSTEM
Tomislav Dragovic Washington NASA Sep. 1975 15 p refs Transl. into ENGLISH from paper from the 1st Yugoslav Aerocosmonautics Conf. (Belgrade), 19-20 May 1973 p 47-57
(Contract NASw-2790)
(NASA-TT-F-16560; Commun-2) Avail: NTIS HC $3.25 CSCL 20D

Passive flow dynamics are described which result from small sinusoidal perturbations in a numerical pressure-measurement system. A study is made of the response of a system consisting of Pitot tube, a connecting tube, and a pressure sensor to the application of small sinusoidal pressure perturbations at the inlet to the Pitot tube. This allows the calculation of the optimal cadence of the pressure distributor, which, in turn, makes possible the determination of the maximum number of measurement points for the given working conditions. The proposed system is intended for use in a hypersonic wind tunnel at Mach 7. Author

N75-31384*# Kanner (Leo) Associates, Redwood City, Calif.
DETERMINATION OF THE FORMATION PRESSURE OF BUBBLES IN LIQUIDS
G. Minelli Washington NASA Sep. 1975 15 p refs Transl. into ENGLISH from Tec. Ital. (Trieste), v. 32, Nov. 1967 p 763-768
(Contract NASw-2790)
(NASA-TT-F-16570) Avail: NTIS HC $3.25 CSCL 20D

The manner in which bubbles form and increase in a liquid following a pressure decrease was examined. The direct and indirect methods for determining the initial pressure of the formation of bubbles are discussed. An instrument is described which was constructed for the direct determination of initial pressure. Using a piston, the instrument records the pressure for various liquid volumes by means of a diaphragm-type pressure gauge. Experimental results obtained with this instrument are plotted on graphs and compared with theoretical values. Author

N75-31385# Advisory Group for Aerospace Research and Development, Paris (France).
COMPUTATIONAL METHODS FOR INVISCID AND VISCOUS TWO-AND-THREE-DIMENSIONAL FLOW FIELDS
Feb. 1975 200 p refs
(AGARD-LS-73) Avail: NTIS HC $7.00

Developments in the numerical approach of fluid flow problems are presented. Particular emphasis is placed on numerical techniques for the solution of the compressible Navier-Stokes equations and the implementation of turbulence models, the computational techniques for boundary layers, hyperbolic partial differential equations, numerical stability of finite difference methods, numerical solutions of the Navier-Stokes equations for compressible fluids, and finite elements. For individual titles, see N75-31386 through N75-31392.

N75-31386 Technische Hochschule, Aachen (West Germany). Aerodynamisches Inst.
FLOW ANALYSIS THROUGH NUMERICAL TECHNIQUES
Egon Krause *In* AGARD Computational Methods for Invisicid and Viscous Two-and-Three-Dimensional Flow Fields Feb. 1975 11 p refs (For availability see N75-31385 22-34)

Flow analysis by using numerical techniques is demonstrated. Results obtained from integrations of the governing equations are compared with experimental data. The following problems are discussed: the inviscid flow about a sphere at supersonic Mach-numbers, calculated with Rusanov's algorithm; incompressible and compressible laminar turbulent boundary layers on infinite swept wings, calculated with second- and fourth-order accuracy for three different scalar closure assumptions; and hypersonic laminar and turbulent slot injection of frozen flow (He and H2) and flow in approximated chemical equilibrium (H2). Finally applications of finite-difference solutions are to be discussed for fully viscous flows in biofluidmechanical problems. Author

N75-31387* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL TECHNIQUES FOR THE SOLUTION OF THE COMPRESSIBLE NAVIER-STOKES EQUATIONS AND IMPLEMENTATION OF TURBULENCE MODELS
Barrett S. Baldwin, Robert W. MacCormack, and George S. Deiwert *In* AGARD Computational Methods for Inviscid and Viscous Two-and-Three-Dimensional Flow Fields Feb. 1975 24 p refs (For availability see N75-31385 22-34)

The time-splitting explicit numerical method of MacCormack is applied to separated turbulent boundary layer flow problems. Modifications of this basic method are developed to counter difficulties associated with complicated geometry and severe numerical resolution requirements of turbulence model equations. The accuracy of solutions is investigated by comparison with exact solutions for several simple cases. Procedures are developed for modifying the basic method to improve the accuracy. Numerical solutions of high-Reynolds-number separated flows over an airfoil and shock-separated flows over a flat plate are obtained. A simple mixing length model of turbulence is used for the transonic flow past an airfoil. A nonorthogonal mesh of arbitrary configuration facilitates the description of the flow field. For the simpler geometry associated with the flat plate, a rectangular mesh is used, and solutions are obtained based on a two-equation differential model of turbulence. Author

N75-31388 Sandia Labs., Albuquerque, N.Mex.
COMPUTATIONAL TECHNIQUES FOR BOUNDARY LAYERS

F. G. Blottner *In* AGARD Computational Methods for Inviscid and Viscous Two-and-Three-Dimensional Flow Fields Feb. 1975 51 p refs Sponsored by ERDA (For availability see N75-31385 22-34)

The status of the numerical computation of boundary layers is given for two- and three-dimensional flows. The appropriate transformations to apply to the governing equations are considered, and the possible solution procedures are dismissed. Emphasis is on the finite-difference procedures which are illustrated for two-dimensional, incompressible flows. For compressible flows the Crank-Nicolson technique is given. The changes which are needed to this approach when the flow is turbulent, are presented. The finite-difference procedures utilized for unsteady flows are given. Solution techniques for three-dimensional flows are described and the features which are different from two-dimensional flows are emphasized. Author

N75-31389 Uppsala Univ. (Sweden). Dept. of Computer Sciences.

DIFFERENCE APPROXIMATIONS FOR TIME DEPENDENT PROBLEMS

Heinz-Otto Kreiss *In* AGARD Computational Methods for Inviscid and Viscous Two-and-Three-Dimensional Flow Fields Feb. 1975 33 p refs (For availability see N75-31385 22-34)

The Cauchy problem for partial differential equations is considered. Examples and notations are given which include: initial value problems, wave equations, heat equations, and linearized shallow water equations. Other topics discussed include: difference approximation for the Cauchy problem, initial boundary value problems for hyperbolic partial differential equations, the energy method, and the Laplace transform. J.M.S.

N75-31390 Reading Univ. (England). Dept. of Mathematics.

STABILITY AND ACCURACY OF NUMERICAL APPROXIMATIONS TO TIME DEPENDENT FLOWS

K. W. Morton *In* AGARD Computational Methods for Inviscid and Viscous Two-and-Three-Dimensional Flow Fields Feb. 1975 12 p refs (For availability see N75-31385 22-34)

The basic Lax-Richtmyer theory of the stability and convergence of linear difference schemes is considered. Some of the more demanding requirements met in practical fluid flow calculations, including the control of nonlinear instabilities, dissipation, and dispersion are discussed along with the modeling of conservation properties and the implementation of boundary conditions. The use of the modified equation approach is studied as an alternative to the Lax-Richtmyer theory. An error analysis for finite element methods is given showing the high accuracy that may sometimes be achieved with the correct treatment of nonlinear terms. Author

N75-31391 Paris Univ. (France).

NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATIONS FOR COMPRESSIBLE FLUIDS

Roger Peyret and Henri Viviand (ONERA) *In* AGARD Computational Methods for Inviscid and Viscous Two-and-Three Dimensional Flow Fields Feb. 1975 14 p refs (For availability see N75-31385 22-34)

Numerical methods for the solution of the Navier-Stokes equations for compressible fluids are discussed. A short review of the Navier-Stokes equations and of their qualitative mathematical properties, and a discussion of their interest in aerodynamics problems are presented. The following aspects of numerical methods are considered: limitation of the domain of calculation and boundary conditions on the outer boundary; various approaches in finite difference methods and properties of some representative schemes; treatment of the boundary condition at a solid wall; treatment of shock waves and general considerations on accuracy and computation times. Author

N75-31392 Laboratoire d'Informatique pour la Mecanique et les Sciences de l'Ingenieur, Paris (France).

APPLICATIONS OF FINITE ELEMENT METHODS IN FLUID DYNAMICS

C. Bellevaux and M. Maille (Pierre et Marie Curie Univ.) *In* AGARD Computational Methods for Inviscid and Viscous Two-and-Three-Dimensional Flow Fields Feb. 1975 28 p refs (For availability see N75-31385 22-34)

An example of the finite element method is considered which demonstrates the problems of functional analysis and the numerical techniques used. Elements of functional analysis necessary for a rigorous formulation are used to generalize the example. Other topics discussed include: the method of singularities and the linear and nonlinear case of Navier-Stokes equations for viscous flows. Author

N75-31393# Air Force Systems Command, Wright-Patterson AFB, Ohio. Ramjet Technology Div.

APPROXIMATE ANALYSIS OF A LAMINAR ELLIPTICAL JET

Herman Viets 28 Aug. 1975 29 p refs Backup document for AIAA synoptic scheduled for publication in AIAA Journal in Dec. 1975

Avail: NTIS HC $3.75

A laminar jet issuing from a three-dimensional orifice of elliptical shape is analyzed by the use of the boundary layer assumptions in the mixing region of the jet. The full three-dimensional equations are reduced to a set of quasi-two-dimensional boundary layer equations. These equations are solved numerically and predict a decrease in the half width dimension of the major axis of the ellipse. This decrease was observed in three-dimensional turbulent jets. Author

N75-31394# Oxford Univ. (England). Dept. of Engineering Science.

STEADY AND UNSTEADY FLOW IN A SEMI-CYLINDRICAL HOLLOW Interim Report

T. A. Snuggs and J. K. Aggarwal 1975 59 p refs Sponsored by Sci. Res. Council

(OUEL-1118/75) Avail: NTIS HC $4.25

An experimental flow system was constructed to investigate the phenomena associated with both steady and time-dependent flow in the region of a semi-circular hollow. Design criteria are presented followed by a description and discussion of the apparatus. Dye was used as a means of qualitative flow visualization in and around the hollow, and particles were chosen in preference to hydrogen bubbles for quantitative velocity measurements. Unsuccessful attempts were made at measuring wall static pressure variations in the hollow. A design of wall shear stress probe the output of which is expected to be independent of flow direction is developed. A numerical investigation was pursued using a fourth-order finite difference technique and was applied to a particular steady-flow problem. The method is also suitable for application to time-dependent flows. Significant exchange of fluid between the hollow and the mainstream is observed during time-dependent flow whereas during steady flow there is only slight fluid exchange associated with a random shedding at the downstream hollow lip. Author (ESRO)

N75-31395# Arbeitsgruppe fuer Ballistische Forschung, Weil am Rhein (West Germany).

INVESTIGATION OF FLOW PHENOMENA ASSOCIATED WITH THE MUZZLE FLASH OF SMALL CALIBER GUNS

G. A. Schroeder and G. Klingenberg Nov. 1974 39 p refs Presented at the 1st Intern. Symp. on Ballistics, Orlando, Fla., 13-15 Nov. 1974

(ABF-E-2/74) Avail: NTIS HC $3.75

In view of the development of high performance guns incorporating high maximum gas pressures, a thorough understanding of side effects associated with the outflow of the propellant gas out of the muzzle during and after projectile exit is required. A down scaled investigation into such flow phenomena using small caliber guns was made. The data deal mainly with the muzzle flash and its dependence on the propellant gas flow. It is shown that by spectroscopic methods gas temperatures can be derived from the muzzle flash for the flow field both inside and outside the bore. A method to determine gas flow velocities by means of laser induced gas breakdown is described and results are presented for such measurements inside muzzle flow fields. Author (ESRO)

N75-31396# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

IMPROVED NOZZLE TESTING TECHNIQUES IN TRANSONIC FLOW. INFLUENCE OF JET PARAMETERS. PART 1: NOZZLE THRUST AND DISCHARGE COEFFICIENTS

C. C. Groothoff Feb. 1975 43 p refs Submitted for publication
(NLR-MP-75008-U) Avail: NTIS HC $3.75

Internal flow and nozzle characteristics were analyzed as part of the program coordinated by the AGARD ad hoc study group. All available data were used in a comparison of the nozzle discharge and thrust coefficients and jet pipe wall statio pressures of similar model configurations. It was found necessary to take into account the distortion of the total pressure profiles in the jet pipe. The mass flow averaged total was used in the calculations. The distortion coefficient DCM proved to be a useful tool in the comparison of the mass flow averaged total pressure with the 1-D isentropical total pressure, derived from mass flow, temperature, and static pressure. Author (ESRO)

N75-31397# European Space Research Organization, Paris (France).
ON THE STABILITY OF FREE CONVECTION FLOW ALONG A HEATED VERTICAL PLATE
Klaus Menzel Mar. 1975 120 p refs Transl. into ENGLISH of "Ueber das Stabilitaetsverhalten der freien Konvektionsstroemung an einer beheizten vertikalen Platte", DFVLR, Freiburg i. B. Report DLR-FB-73-92, 27 Jul. 1973 Original German report available from DFVLR, Porz, West Ger. 33.10 DM
(ESRO-TT-149; DLR-FB-73-92) Avail: NTIS HC $5.25

A nonlinear analysis of the stability of a flow along a flat plate (Blasius) was applied to the free-convection flow along a heated vertical plate. Together with amplified linear oscillations of the Tollmien-Schlichting type, amplified three-dimensional oscillations were investigated. The superposition of these two linear oscillations shows the characteristic M-shaped profile in the main-stream direction. The numerical treatment of the quadratic nonlinear terms occurring in a perturbation series expansion shows a dominant multiple system of longitudinal vortices of the Taylor-Goertler type. Its amplification rate is the sum of the rates of the two linear oscillations. Among the nonlinear components dependent upon the mainstream direction, the interaction constituents for the linear perturbations are also dominant. Author (ESRO)

N75-31398# European Space Research Organization, Paris (France).
INVESTIGATIONS OF AXISYMMETRIC HYPERSONIC FREE JETS IN HIGH TOTAL ENTHALPY WIND TUNNELS
Demetrius G. Papanikas Mar. 1975 235 p refs Transl. into ENGLISH of "Untersuch. von Axialsymmetrischen Hyperschall-Freistrahlen in Windkanalmessstrecken hoher Gesamtenthalpie," DFVLR, Porz, West Ger. Report DLR-FB-74-52, 17 Jul. 1974 Original German report available from DFVLR, Porz, West Ger. 80.90 DM
(ESRO-TT-150; DRL-FB-74-52) Avail: NTIS HC $7.50

Axisymmetric hypersonic fully expanded free jets in an arc heated wind tunnel were investigated experimentally. The Reynolds number referred to nozzle exit diameter is on the order of 10,000. The stagnation temperatures of the test gases - Argon, and up to dissociated air - are from 2000 to 5000 K and the mean free path from 0.3 to 10 mm. Pitot probes, total enthalpy, and mass flow probes were used for the experiments. The free jet equations based on the boundary layer approximation were solved numerically by an implicit scheme. From the comparison of theoretical and experimental results the revelant influences due to high temperature and low density on the steam conditions at jet origin and at jet near field can be observed. The basic question about the jet spreading mode is discussed. The results of investigations in the near field indicate the laminar flow character of the investigated free jets. Author (ESRO)

N75-31399# European Space Research Organization, Paris (France).
FLAME STABILIZATION IN AFTERBURNING FLOWS AT HIGH PRESSURE BY MEANS OF AIR OR LIQUID JETS
Werner Dobrzynski and Karl Baumann Mar. 1975 36 p refs Transl. into ENGLISH of "Flammenstabilisierung in Nachbrennerstroemungen hohen Druckes mit Luft- oder Fluessigkeitsstrahlen", DFVLR, Brunswick Report DLR-FB-74-59, 23 Jul. 1974 Original German report available from DFVLR, Porz, West Ger. 16 DM
(ESRO-TT-153; DLR-FB-74-59) Avail: NTIS HC $3.75

Investigations were conducted in a hot gas flow at a pressure range of 3 to 14 bar. Experiments with hydrodynamic flame stabilization prove impracticable when hydrogen peroxide in a concentration of 35% is used as a stabilizing medium. Afterburning efficiency, blow-out velocity, and loss of total pressure were determined for the case of aerodynamic flame stabilization within the above pressure range. With operating pressure rising, the maximum afterburning efficiency and blow-out velocity drop, and blow-out limits shift to lower excess air coefficients. Loss of total pressure is essentially influenced by the depth of penetration of stabilizing jets. Author (ESRO)

N75-31400# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COMPUTATIONAL IMPLICATIONS OF THE ZONE OF DEPENDENCE CONCEPT FOR THREE-DIMENSIONAL BOUNDARY LAYERS ON A SPINNING BODY Final Report
Clarence W. Kitchens, Jr., Nathan Gerber, and Raymond Sedney Apr. 1975 58 p refs
(AD-A009487; BRL-1774) Avail: NTIS CSCL 20/4

The properties of the three-dimensional boundary-layer equations and the influence of these properties on numerical solutions are examined. The three-dimensional boundary-layer equations are parabolic, but they possess a secondary hyperbolic-like, property. This hyperbolic property leads to the zone of dependence concept. It is shown that the zone of dependence concept plays an important role in obtaining accurate numerical solutions for three-dimensional boundary-layer problems; it is especially important for calculating the boundary layer on a spinning body at incidence. A simple flow field which simulates the essential features of this problem and is an exact solution of the three-dimensional boundary-layer equations is constructed. GRA

N75-31401# Pennsylvania State Univ., University Park. Applied Research Lab.
CAVITATION BREAKDOWN OF A PUMP OPERATING IN WATER HAVING A DILUTE POLYMER CONCENTRATION
M. L. Billet and W. S. Gearhart 20 Mar. 1975 45 p refs
(Contract N00017-73-C-1418)
(AD-A009825; TM-75-66) Avail: NTIS CSCL 13/11

An experimental program comparing the performance of a single stage axial flow pump operating in both water and a 30 ppm solution of Polyox 301 is discussed in this report. Definitive results demonstrate that higher suction specific speeds at pump breakdown are obtained when pumping a dilute polymer solution. Photographs of pump breakdown are shown for both water and dilute polymer solution. GRA

N75-31402# ARO, Inc., Arnold Air Force Station, Tenn.
EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF NEAR-FIELD COAXIAL MIXING Interim Report, 1 Jul. 1972 - 30 Jun. 1974
D. E. Chriss and P. T. Harsha AEDC Apr. 1975 136 p refs Sponsored by AF
(AF Proj. 9711)
(AD-A009149; AEDC-TR-75-54; AFOSR-75-0512TR) Avail: NTIS CSCL 20/4

In the near field of coaxial jets, the structure of the flow field undergoes rapid changes as it evolves from the boundary layers at the nozzle exit, through a quasi-two-dimensional shear-layer region, to an axisymmetric jet flow. These rapid changes in flow structure have raised questions concerning the applicability of turbulent flow models in the near field, but few experimental results are available to test predictive techniques. In this report, the results of a series of experiments concerned with the near field of coaxial, nearly constant density, air-air jets are described. The experiments were carried out at an external stream velocity of 30.5 m/sec, and at nominal inner jet-to-outer jet velocity ratios of 3:1, 2:1, and 1:1. GRA

N75-31403# Stanford Research Inst., Menlo Park, Calif.
PROBLEMS IN LAMINAR FLOW-TURBULENT FLOW
K. M. Case, F. W. Perkins, A. M. Despain, J. F. Vesecky, and E. A. Frieman Apr. 1975 81 p refs
(Contract DAHC15-73-C-0370; SRI Proj. 3000)

(AD-A009261; SRI-JSR-74-2) Avail: NTIS CSCL 20/4

A program is suggested for the numerical simulation of the transition from laminar to turbulent flow. It is believed that this will materially improve insight into transition and that it should improve ability to make predictions. The problems to be treated (in a preliminary ordering) are: transition in the boundary layer over a flat plate, transition in the wake of a flat plate, transition in the flow over wedges (Falkner-Skan profiles), and modifications of the flat-plate transition due to suction, roughness, compliant boundary conditions, and heating. GRA

N75-31404# Naval Surface Weapons Center, White Oak, Md.
VERTICAL WATER ENTRY OF SOME OGIVES, CONES, AND CUSPS Interim Report
John L. Baldwin 21 Mar. 1975 55 p
(AD-A009300; NSWC/WOL/TR-75-20) Avail: NTIS CSCL 20/4

An experimental investigation of the vertical water-entry deceleration of two ogive shapes and two cusp shapes is described. For each of these four shapes, the total drag coefficient and added mass are determined as functions of penetration distance. These results, combined with previous work, provide a display of possible values for maximum water-entry drag coefficient as a function of forebody fineness ratio. GRA

N75-31405# Naval Research Lab., Washington, D.C.
GENERALIZATIONS OF THE FLUX-CORRECTED TRANSPORT TECHNIQUE
David L. Book, Jay P. Boris, and Klaus Hain Apr. 1975 70 p refs
(NR Proj. H02-027A; DNA Proj. NWED-QAXH-C042)
(AD-A009741; NRL-MR-3021) Avail: NTIS CSCL 20/4

The recently developed method of Flux-Corrected Transport (FCT) can be applied to many of the finite-difference transport schemes presently in use. The result is a class of improved algorithms which add to the usual desirable properties of such schemes conservation, stability, second-order (in some cases) accuracy, etc. -the property of maintaining the intrinsic positivity of quantities like density, energy density, and pressure. Illustrations are given for algorithms of the Lax-Wendroff, leapfrog, and upstreaming types. The errors introduced by the flux-correction process which lies at the heart of the method are cataloged and their effect described. Phoenical FCT, a refinement which minimizes residual diffusive errors, is analyzed. Application of FCT to general fluid systems, multidimensions, and curvilinear geometry are described. The results of computer tests are shown in which the various types of FCT are compared with one another and with some conventional algorithms. GRA

N75-31406# Naval Research Lab., Washington, D.C.
MINIMIZING ERRORS IN FLUX-CORRECTED TRANSPORT ALGORITHMS Interim Report
J. P. Boris and D. L. Book Apr. 1975 59 p refs
(AD-A009742; NRL-MR-3024) Avail: NTIS CSCL 20/4

This paper presents an error analysis of numerical algorithms for solving the convective continuity equation using Flux-Corrected Transport techniques (FCT). The goal of the paper is threefold: First, the nature of numerical errors in Eulerian finite-difference solutions to the continuity equation is analyzed. Second, the properties and intrinsic errors of an optimal algorithm are discussed and such an FCT algorithm is demonstrated for a restricted class of problems. This optimal FCT algorithm is applied to a model test problem and the error is monitored for comparison with more generally applicable algorithms. Third, several improved FCT algorithms are developed and judged against both standard flux-uncorrected transport algorithms and the optimal algorithm. Thes3 improved FCT algorithms are found to be four to eight times more accurate than standard non-FCT algorithms, nearly twice as accurate as the original SHASTA FCT algorithm, and approach the accuracy of the optimal algorithm. GRA

N75-31407# Naval Postgraduate School, Monterey, Calif.
AN EXPERIMENTAL STUDY OF TAYLOR-GOERTLER VORTICES IN A CURVED RECTANGULAR CHANNEL M.S. Thesis
David Lee Flentie Mar. 1975 63 p refs
(AD-A009574) Avail: NTIS CSCL 20/4

A rectangular cross section channel, designed and built by R. McKee to create the laminar secondary Taylor-Goertler vortex flow, was modified to expand the experimental investigation of the vortex flow. The modification allowed the hot wire anemometer, used to obtain velocity profiles, to be moved in both the radial and transverse direction. This additional freedom permitted a rectangular cross section of the flow to be investigated. It was concluded that the onset of Taylor-Goertler vortices was in agreement with existing information, that the intensity of the vortices increased with increasing flow rate, and turbulent fluctuations grew within the vortex structure. GRA

N75-31408# Texas A&M Univ., College Station. Coastal and Ocean Engineering Div.
NUMERICAL SOLUTIONS FOR DETERMINING WAVE INDUCED PRESSURE DISTRIBUTIONS AROUND BURIED PIPELINES
N. W. Lai, R. F. Dominguez, and W. A. Dunlap Dec. 1974 105 p refs
(Grant NOAA-04-3-158-18)
(COM-75-10503/1; TAMU-SG-75-205; NOAA-75040202) Avail: NTIS HC $5.25 CSCL 13K

Numerical models using both the finite difference and finite element technique are developed to simulate the interaction of a two-dimensional pipe-soil-wave system. The wave-induced pressure distribution in the soil region without an embedded pipe is first studied and solutions validated by comparing with existing analytical and experimental results. Numerical models are then used to solve the dynamic pressure distribution around buried pipes. It is found that the embedded pipe causes an increase of pressure at the top region of the pipe and a decrease at the bottom. Parameter studies are conducted to determine the influence of some of the significant factors on the pressure distribution pattern around the buried pipe. GRA

N75-31409# TRW Systems Group, Redondo Beach, Calif.
CONTINUOUS MEASUREMENT OF TOTAL GAS FLOWRATE FROM STATIONARY SOURCES Environmental Protection Technology Series. Final Report, Oct. - Dec. 1974
E. F. Brooks, E. C. Beder, C. A. Flegal, D. J. Luciani, and R. Williams Feb. 1975 264 p refs
(Contract EPA-68-02-0636)
(PB-241894/5) Avail: NTIS HC $8.50 CSCL 20D

The program objectives were to evaluate hardware and techniques for the continuous measurement of the total gas flowrate from stationary sources, specifically in large or complex ducts where total flow metering devices such as plate orifices are not practical. Work consisted of formulation of operating specifications, evaluation of commercially available velocity sensors, development and evaluation of flow mapping techniques, and field demonstration of both hardware and technique. Results showed that total volumetric flowrate can be measured with accuracies consistently better than 10% in either circular or rectangular ducts. Several off-the-shelf velocity sensors were found acceptable for use in the specified stack-type environment. GRA

N75-31410# Norske Veritas, Oslo.
A STUDY OF DYNAMIC LOADS CAUSED BY LIQUID SLOSHING IN LNG TANKS. VOLUME 1: TEXT AND FIGURES
H. A. Olsen and T. Hysing Dec. 1974 299 p refs
(Contract MA-3-36282)
(COM-75-10517/1; Rept-74-276-C; MA-RD-920-75040) Avail: NTIS HC $8.75 CSCL 13J

The effects of fluid properties on scaling liquid sloshing pressures and forces were investigated. Sloshing pressures and forces were measured in both prismatic and spherical tanks for a range of fill depths, excitation amplitudes and frequencies. Loads on internal tank components, such as pump towers, were also determined for spherical tanks. GRA

N75-31411# Iowa Inst. of Hydraulic Research, Iowa City.
WINTER-REGIME SURFACE HEAT LOSS FROM HEATED STREAMS
P. P. Paily, Enzo O. Macagno, and John F. Kennedy Mar. 1974 154 p refs Sponsored in part by Iowa State Water Resources Research Inst., Ames, Iowa
(Grant NSF GK-35910)

(PB-241941/4; IIHR-155; W75-07990; OWRT-B-018-IA(3)) Avail: NTIS HC $6.25 CSCL 13B

Evaluation of the rate of surface heat exchange between the water and air has become significant because of the need to determine the thermal response of streams to heat inputs. The different mechanisms of heat exchange that contribute to the total heat exchange are discussed, and the various empirical formulas to compute each of the components are presented and discussed. The suitability of each empirical formula was examined. The methods to linearize the total heat exchange rate are reviewed, and a new linearized relation is proposed. General equations, suitable for winter-regime conditions, are presented to compute the coefficients of the linearized heat loss model. GRA

N75-31412# Aerospace Corp., El Segundo, Calif.
NUMERICAL SOLUTION OF THE UNSTEADY NAVIER-STOKES EQUATIONS FOR THE OSCILLATORY FLOW OVER A CONCAVE BODY Final Report
George F. Widhoph and Keith J. Victoria 23 Sep. 1974 19 p refs
(Contract F04701-74-C-0075)
(SAMSO-TR-75-66; AD-A009654; TR-0075(5450-15)-1) Avail: NTIS CSCL 20/4

The hypersonic flow field over a concave shape has been investigated by numerically solving the unsteady Navier-Stokes equations. Calculations were performed at a freestream Mach number of 10 and a Reynolds number based on freestream properties and the forebody radius of 333. A fully attached high frequency oscillatory flow field was found to exist over the entire surface. This type of oscillation is unique since experimentally observed oscillatory flows about concave shapes have contained separated regions. The nature of the oscillation, its effect on surface properties and the postulated origin of the oscillation, is discussed. Specifically, the flow field appears to be hydrodynamically unstable which results in an oscillatory variation of the flow downstream of the forebody pressure minimum. The resultant temporal variations of the surface pressure and heat transfer are large in the region of the shock inflection point. GRA

N75-31413# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COMPRESSIBLE TURBULENT BOUNDARY LAYER COMPUTATIONS FOR FLOW WITH LONGITUDINAL CURVATURE Final Memorandum Report
Walter B. Sturek Mar. 1975 21 p refs
(AD-A009703; BRL-MR-2457) Avail: NTIS CSCL 20/4

A numerical study has been performed using a finite-difference boundary layer computer program that includes corrections to the equations of motion for longitudinal curvature and allows the static pressure to be specified as a known function of x and y. Calculations with and without the corrections for longitudinal curvature and pressure gradient normal to be the local surface have been compared to experimental measurements of a supersonic turbulent boundary layer flow over a surface with concave longitudinal curvature. Substantially improved agreement with experimental measurements is obtained for the calculations including corrections for wall curvature and pressure gradient normal to the local surface for density profile, skin friction coefficient, and boundary-layer integral properties. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-31414 Purdue Univ., Lafayette, Ind.
LASER INDUCED QUANTUM COUNTER ACTION OF TRIVALENT RARE-EARTH IONS IN LANTHANIDE HALIDE HOSTS Ph.D. Thesis
Daniel Edward Cox 1974 186 p
Avail: Univ. Microfilms Order No. 75-17175

The general features and basic concepts of the infrared quantum counter (IRQC) are presented and analyzed in terms of optimization parameters which are derived from a phenomenological rate equation model of the upconversion process. Use of a high power continuous tunable dye laser as the pump source is shown to maximize one of these parameters, the induced pump transition rate, and improve overall quantum counter performance by several orders of magnitude. These systems, which are examined in terms of their energy level structure, the interactions of the optically active ion with radiation, and the influence of the host crystalline environment on these interactions, are shown to meet most of the requirements of good quantum counters. A method for the growth of large optically suitable single crystals of 14 of the 15 lanthanide chlorides and 12 of the 15 lanthanide bromides, in addition to the chloride and bromide of yttrium and scandium, is presented. Dissert. Abstr.

N75-31415 Maryland Univ., College Park.
THE AMPLITUDE INTERFEROMETER: DESIGN, TESTING AND ASTROMETRIC RESULTS Ph.D. Thesis
Kurt Matthew Liewer 1974 156 p
Avail: Univ. Microfilms Order No. 75-17887

The details of a method, amplitude interferometry, for obtaining high angular resolution through the earth's atmosphere and the results obtained with an instrument based on this theory are presented. The theory behind the method is developed in increasing stages of complexity as atmospheric and instrumental effects are added to the basic theory, and limits are placed upon certain parameters which affected the design of the actual instrument. A detailed description of the interferometer is presented. Extensive laboratory work was performed to determine some instrument parameters and to search for possible systematic errors. The results of observations of a laboratory source showed that the operation was as predicted. It was also shown that the instrument operates in a reasonable fashion when used in conjunction with a telescope and in presence of the atmosphere. Dissert. Abstr.

N75-31416 Purdue Univ., Lafayette, Ind.
A COMPOSITE NEUTRON ACTIVATION DOSIMETER Ph.D. Thesis
John Frank Agnew 1972 256 p
Avail: Univ. Microfilms Order No. 75-17134

Experiments were conducted to study the feasibility of a neutron dosimeter containing several neutron activation detectors incorporated into a single composite. A Ge(Li) gamma ray spectrometer system was used to measure the activities of the neutron-induced radioactive products. Analysis of the gamma-ray spectral data leading to calculations of the neutron fluence rate and dose equivalent was performed by computer. An existing computer program for the analysis of Ge(Li) spectra known as BRUTAL was modified to accomplish this goal. The analytical method utilized involves expressing the activation rate of a material in terms of parameters already developed for characterizing a well-moderated neutron spectrum. The activation formulae for two materials form simultaneous equations in two unknowns: the neutron density and the epithermal index. Dissert. Abstr.

N75-31417*# Technicolor Graphic Services, Inc., Houston, Tex.
PHOTOGRAPHIC IMAGE ENHANCEMENT AND PROCESSING
Harold E. Lockwood Aug. 1975 32 p
(Contract NAS9-11500)
(NASA-CR-144429) Avail: NTIS HC $3.75 CSCL 14E

Image processing techniques (computer and photographic) are described which are used within the JSC Photographic Technology Division. Two purely photographic techniques used for specific subject isolation are discussed in detail. Sample imagery is included. Author

N75-31418*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF AND MEANS FOR TESTING A TAPE RECORD/PLAYBACK SYSTEM Patent Application
Gabriel R. Wallace, William E. Salter (Sperry Rand Corp.,

Huntsville, Ala.), Glenn D. Weathers (Sperry Rand Corp., Huntsville, Ala.), and Sidney S. Gussow, inventors (to NASA) (Sperry Rand Corp., Huntsville, Ala.) Filed 25 Mar. 1975 18 p
(Contract NAS8-21812)
(NASA-Case-MFS-22671-2; US-Patent-Appl-SN-561956) Avail: NTIS HC $3.25 CSCL 14B

A test set for communications systems is described which includes a pseudo-noise sequence generator providing a test signal that is fed to a pair of signal channels. The first channel includes a spectrum shaping filter and a conditioning amplifier. The second channel includes a variable delay circuit, a spectrum shaping filter matched to the first filter, and an amplifier. The output of the first channel is applied to the system under test. The output of the system and the output of the second channel are compared to determine the degree of distortion suffered by the test signal due to the communications system. NASA

N75-31419*# Department of Transportation, Cambridge, Mass. Transportation Systems Center.
PHOTOGRAPHIC FILM IMAGE ENHANCEMENT Final Report, Oct. 1971 - Feb. 1975
J. L. Horner Jul. 1975 53 p refs Sponsored by NASA
(NASA-CR-143441; DOT-TSC-NASA-75-1) Avail: NTIS HC $4.25 CSCL 14E

A series of experiments were undertaken to assess the feasibility of defogging color film by the techniques of optical spatial filtering. A coherent optical processor was built using red, blue, and green laser light input and specially designed Fourier transformation lenses. An array of spatial filters was fabricated on black and white emulsion slides using the coherent optical processor. The technique was first applied to laboratory white light fogged film, and the results were successful. However, when the same technique was applied to some original Apollo X radiation fogged color negatives, the results showed no similar restoration. Examples of each experiment are presented and possible reasons for the lack of restoration in the Apollo films are discussed. Author

N75-31420*# Technicolor Graphic Services, Inc., Houston, Tex.
RECIPROCITY TESTING OF KODAK FILM TYPE SO-289 MULTISPECTRAL INFRARED AERIAL FILM
H. E. Lockwood Aug. 1975 33 p
(Contract NAS9-11500)
(NASA-CR-144427; JSC-09908) Avail: NTIS HC $3.75 CSCL 14E

Kodak multispectral infrared aerial film type SO-289 was tested for reciprocity characteristics because of the variance between the I-B sensitometer exposure times (8 seconds and 4 seconds) and the camera exposure time (1/500 second) used on the ASTP stratospheric aerosol measurement project. Test exposures were made on the flight emulsion using a Mead star system sensitometer, the films were processed to ASTP control standards, and the resulting densities read and reciprocity data calculated. It was found that less exposure was required to produce a typical density (1.3) at 1/500 second exposure time than at an 8 second exposure time. This exposure factor was 2.8.
Author

N75-31421# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Service Technologie Spatiale.
STORAGE IMAGING DETECTOR (EAID)
P. Balaskovic and J. Denis Paris ESRO Jan. 1975 47 p refs In FRENCH; ENGLISH summary
(Contract ESTEC-1038/70)
(ESRO-CR-40) Avail: NTIS HC $3.75

The possibility is evaluated of developing a storage imaging detector based on presently known principles or devices. The characteristics are described of an image tube of the type sought, and the various limitations due to equipment external to the tube are evaluated. Characteristics compatible with these limitations are defined. This theoretical study of image tubes makes it possible to define selection criteria which leads to a comparative examination of existing structures and to a study of new physical processes. Comparison of the desired characteristics with these two series of possibilities led to a set of proposals. Author (ESRO)

N75-31422# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung e. V., Freiburg (West Germany). Inst. fuer Angewandte Festkoerpermechanik.
IMAGING TECHNOLOGIES FOR TERMINALS Final Report
Guenter Baur, Manfred Schiekel, and Werner Veith Bonn Bundesmin. fuer Forsch. u. Technol. Jun. 1975 191 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-75-14) Avail: NTIS HC $7.00; ZLDI, Munich DM 40.11

The latest development in vidicons as well as solid state sensor technologies for image pick-up are treated in detail. In the field of displays, flat panels in the form of plasma and liquid crystal panels are considered, followed by image projection devices using light valves. New aspects of electron tubes and small numerical displays are also treated. Techniques related to electronic image recording for telecopy are discussed. ESRO

N75-31423# Institut Franco-Allemand de Recherches, St. Louis (France).
STUDY BY HOLOGRAPHIC INTERFEROMETRY OF THE SURFACE DISTORTION OF A CERAMIC PLATE DUE TO BULLET IMPACTS
F. Albe, P. Smigielski, and H. Fagot 2 Aug. 1974 9 p Presented at the Congr. of the Intern. Comm. for Opt., Tokyo, 19-23 Aug. 1974 Submitted for publication
(ISL-CO-11/74) Avail: NTIS HC $3.25

Double-exposure holography was used to study the surface distortion. The samples studied were distorted then broken by impact. The time interval between the impact and beginning of rupture ranges from 1.8 to 10 micros depending on the speed of the projectile. The contour lines of the rear face were observed by holographic interferometry during this interval. This requires very short light pulses and a precise synchronization both of which are obtained by the use of a ruby laser switched by a Pockels cell. ESRO

N75-31424# European Space Research Organization, Paris (France).
POSSIBILITIES OF APPLYING THE ASTROMETRIC POLYNOMIAL MODEL FOR DIRECTION FINDING USING PHOTOGRAPHS OF BALLISTIC CAMERAS
Holger Schnuerer Mar. 1975 200 p refs Transl. into ENGLISH of "Die Anwendungsmoeglichkeiten des astrometrischen Polynommodells zur Richtungsbestimmung aus photographischen aufnahmen ballistischer Kameras", DFVLR, Brunswick Report DLR-FB-74-58, 4 Apr. 1974 Original German report available from DFVLR, Porz, West Ger. 36 DM
(ESRO-TT-151; DLR-FB-74-58) Avail: NTIS HC $7.00

The possibility of reducing photographs from ballistic cameras astrometrically was investigated. Theoretical investigations show that the astrometric polynomial model can cover the physical and geometrical conditions during exposure if the model conceptions of the photogrammetric method are taken as a basic. Error theory and method of adjustment are strict. The results of astrometric and photogrammetric reductions of the total image field of BC4 photographs do not show significant differences; therefore, astrometric polynomial model can be used for the reduction of photographs of ballistic cameras. Author (ESRO)

N75-31425# ARO, Inc., Arnold Air Force Station, Tenn.
THE EFFECTS OF SAMPLING PROBE DESIGN AND SAMPLING TECHNIQUES ON AEROSOL MEASUREMENTS Final Report, 1 Jul. 1972 - 30 Sep. 1973
F. H. Smith AEDC May 1975 90 p refs Sponsored by AF (ARO Proj. BF466)
(AD-A009592; ARO-OMD-TR-74-86; AEDC-TR-74-119) Avail: NTIS CSCL 14/2

This report summarizes the results of a research program which used laser instrumentation to determine the effects of sampling probe design and sampling techniques on aerosol measurements. The upstream flow disturbances resulting from the presence of a sampling probe were measured as functions of probe design, extraction rate, gas velocity, and angle of attack. Sampling errors are also given for the probes as functions of these variables. The program and techniques involved are discussed in detail. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-31426* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIATOMIC INFRARED GASDYNAMIC LASER Patent
Robert L. McKenzie, inventor (to NASA) Issued 16 Sep. 1975 9 p Filed 26 Apr. 1971 Supersedes N72-10432 (10 - 01, p 0063)
(NASA-Case-ARC-10370-1; US-Patent-3,906,397; US-Patent-Appl-SN-137391; US-Patent-Class-331-94.5G; US-Patent-Class-331-94.5P) Avail: US Patent Office CSCL 20E

A gasdynamic laser which utilizes the infrared vibration-rotation transitions of a diatomic gas such, as carbon monoxide, is reported. Official Gazette of the U.S. Patent Office

N75-31427* National Aeronautics and Space Administration. Pasadena Office, Calif.
ACOUSTICALLY CONTROLLED DISTRIBUTED FEEDBACK LASER Patent
Charles Elachi, inventor (to NASA) (JPL) Issued 16 Sep. 1975 8 p Filed 28 Jun. 1973 Supersedes N73-27431 (11 - 18, p 2157) Sponsored by NASA
(NASA-Case-NPO-13175-1; US-Patent-3,906,393; US-Patent-Appl-SN-374423; US-Patent-Class-331-94.5C; US-Patent-Class-350-96WG; US-Patent-Class-350-161) Avail: US Patent Office CSCL 20E

A distributed feedback laser that is capable of being continuously tuned and/or scanned is disclosed. The laser is capable of being operated in a continuous wave mode as well as a pulsed mode. A lasing medium and an acoustic transducer are mounted on a substrate to have acoustic waves produce periodic mechanical distortions of the lasing medium to cause corresponding periodic disturbances of the index of refraction of said lasing material. Conventional means of excitation of the lasing medium such as by electron bombardment, laser illumination, and application of electrical current, may be used.
Official Gazette of the U.S. Patent Office

N75-31428 Florida Univ., Gainesville.
TWO-DIMENSIONAL MODEL FOR THE SUBSONIC PROPAGATION OF LASER SPARKS Ph.D. Thesis
Jad Hanna Batteh 1974 92 p
Avail: Univ. Microfilms Order No. 75-16353

The properties of laser sparks were investigated by solving a simplified, two-dimensional energy equation describing the steady state, subsonic propagation of a spark in a channel. The propagation mechanism was assumed to be thermal conduction and thermal radiation and was included as an effective optically thin emission. The solution, obtained in closed form, yielded both axial and radial temperature profiles, as well as the relationship between the laser beam characteristics, the channel radius and the propagation velocity. A model was applied to air sparks of .15 cm and .50 cm radius propagating at velocities up to 20 cm/sec under the influence of CO2 laser radiation. The results indicate a spark length on the order of 1 cm and temperatures near 16,000 K. Approximately half the incident laser intensity is absorbed by the spark. The theory agrees with the experimental results for stationary sparks. Dissert. Abstr.

N75-31429# Watervliet Arsenal, N.Y.
APPLICATIONS OF LASER INTERFEROMETRY IN PRECISION MEASUREMENTS Final Report, Oct. 1973 - Jun. 1974
F. J. Audino and B. R. Taylor Dec. 1974 45 p refs
(AD-A009514; WVT-QA-7405) Avail: NTIS CSCL 20/6

Present methods and equipment for obtaining precision measurement of lengths exceeding 20 or so inches do not provide the required degree of accuracy, repeatability or portability to meet current needs. Inspection methods incorporating the laser interferometer calibration system will provide means of calibrating numerically controlled machines, coordinate measuring machines and long lengths with a high degree of accuracy and confidence. GRA

N75-31430# Avco-Everett Research Lab., Everett, Mass.
PRE-BREAKDOWN LASER TARGET VAPORIZATION AND ENHANCED THERMAL COUPLING Final Technical Report
Dennis A. Reilly and Peter S. Rostler Aug. 1974 49 p refs
(Contract N00014-73-C-0457; ARPA Order 2439)
(AD-A009297) Avail: NTIS CSCL 20/5

Vaporization of metallic targets under the influence of pulsed CO2 laser radiation is observed prior to breakdown plasma formation using the techniques of atomic absorption spectroscopy and time resolved emission spectroscopy. Aluminum targets vaporize in times short compared to predictions based on bulk thermal properties, a behavior which may be attributable to microsurface imperfections. Plasma formation times are consistent with models that assume the presence of metallic vapor. Aluminum targets that experienced plasma breakdown exhibited cratering vs little visible surface damage to targets irradiated at fluxes just below the breakdown threshold. Thermal energy deposition per unit incident energy was increased by a factor of three when the breakdown threshold was exceeded. GRA

N75-31431# Wisconsin Univ., Madison. Dept. of Chemistry.
CHEMICAL LASER STUDIES OF ENERGY PARTITIONING IN PHOTOCHEMICAL AND UNIMOLECULAR REACTIONS Final Technical Report, 1 Feb. 1972 - 31 Aug. 1974
Michael J. Berry Apr. 1975 23 p refs
(Contract N00014-67-A-0128-0022; NR Proj. 015-521)
(AD-A009253) Avail: NTIS CSCL 07/4

Chemical laser techniques have been used to analyze energy partitioning and reaction dynamics in photochemical and unimolecular reactions which yield vibrationally excited hydrogen halide products. Six new unimolecular reaction chemical lasers and fifteen new photochemical lasers have been discovered. A general method for the quantitative determination of product vibrational state distributions has been developed and applied to many of the new lasers in addition to well-known chemical laser systems. Patterns of energy partitioning in first-order reactions reveal highly non-statistical behavior: (a) lasing hydrogen halide products have greater than a statistical allotment of reaction exoergicity and (b) decomposition of some unimolecular and photochemical reactants occurs in a non-RRKM fashion. A non-statistical dynamical model has been formulated for energy partitioning into chemical reaction products; the model is in good accord with experimental results. GRA

N75-31432# Southern Methodist Univ., Dallas, Tex. Dept. of Electrical Engineering.
AMPHOTERIC DOPANTS IN THE ACTIVE REGION OF GaAs LASERS Final Report
K. L. Ashley 15 May 1974 16 p refs
(Contract DAAK02-73-C-0226)
(AD-A009207) Avail: NTIS CSCL 20/5

Double heterojunction lasers were fabricated with Ge and Si in the active region. Spontaneous diodes were fabricated with and without Si and diodes without Si exhibited a shorter wavelength spectral peak by about 9 meV. Diodes with Te compensation were similar to diodes without compensation. The lasers had a characteristic spectral peak at approximately 9000 A. The best quantum efficiency (incremental) measured was approximately 22 percent (0.32 watts/amp). This form of doping in the active region appears to produce diodes which are very favorable with respect to threshold current. Towards the end of the activity a laser wafer was obtained with the same configuration except with Te in lieu of Si as the compensating impurity. GRA

N75-31433# Stanford Research Inst., Menlo Park, Calif.
STUDIES OF E-BEAM PUMPED MOLECULAR LASERS Technical Report, 1 Jul. - 31 Dec. 1974
D. L. Huestis, R. A. Gutcheck, R. M. Hill, M. V. McCusker, and D. C. Lorents 31 Jan. 1975 90 p refs
(Contract N00014-72-C-0478; ARPA Order 1807; SRI Proj. PYU-1925)
(AD-A009284; SRI-MP-75-18; TR-4) Avail: NTIS CSCL 07/4

This report summarizes continued studies of prospective high-power high-efficiency laser media. Included here are the results of a spectroscopic survey of light emission arising from a variety of atomic and molecular gases contained in electron-beam excited rare gas hosts. Also, to predict a laser behavior, a detailed

kinetic model is developed for the xenon-oxygen system, one of the most promising candidates in the survey. To allow the development of this model, several rate constants were measured for the first time. In addition, the structures of several xenon oxide levels were determined from spectroscopic observations. The kinetic model suggests that a xenon oxide laser may operate with an efficiency as high as 6% for the 537.6 nm band and as high as 11% at 308.0 nm. GRA

N75-31434# General Applied Science Labs., Inc., Westbury, N.Y.
TRACK GEOMETRY SURVEY DEVICE FOR LIM RESEARCH VEHICLE TEST TRACK Final Report, Jun. 1971 - Aug. 1972
Hector Medecki and Sergio Panunzio Oct. 1973 117 p
(Contract DOT-FR-10016)
(PB-241313/6; GASL-TR-776; FRA-ORD/D-74-36) Avail: NTIS HC $5.25 CSCL 13F

A track survey device was designed, built and operated to measure the geometry of the FRA linear induction motor test track at Pueblo, Colorado. A laser beam is used for the measurement of profile and alignment; and electronic level for the measurement of super-relation and mechanical sensors for both support rail and reaction rail gages. The measurement is stored in magnetic tape for processing. GRA

N75-31435# Informatics, Inc., Rockville, Md.
EFFECTS OF HIGH POWER LASERS, NUMBER 5, SEPTEMBER 1974 - FEBRUARY 1975
Stuart G. Hibben, J. Kourilo, M. Ness, and B. Shresta 1 May 1975 102 p
(Contract N00600-75-C-0018; ARPA Order 2790)
(AD-A009422) Avail: NTIS CSCL 20/5

This is the fifth compilation of abstracts of Soviet studies on high power laser technology, covering material published from September 1974 through February 1975. Articles are grouped by laser interaction with metals, dielectrics, semiconductors, miscellaneous targets, and laser-plasma interaction. GRA

N75-31436# Columbia Univ., New York. Dept. of Chemistry.
PRIMITIVE ANGULAR DISTRIBUTION STUDIES OF INTERNAL STATES IN CROSSED-BEAM REACTIONS USING LASER FLOURESCENCE DETECTION
Richard N. Zare and Paul J. Dagdigian 5 Jul. 1974 4 p refs Repr. from J. of Chem. Phys., v. 61, no. 6, 15 Sep. 1974 p 2464-2465
(Grant AF-AFOSR-2551-73; AF Proj. 9538)
(AD-A006063; AFOSR-75-0235TR) Avail: NTIS CSCL 20/5

The reaction of Ba and LiCl yields BaCl, and Li has been studied using laser fluorescence detection to observe the BaCl product as a function of internal state scattering angle. GRA

N75-31437# TRW Systems Group, Redondo Beach, Calif.
STUDY AND DEMONSTRATION OF LIQUID AND GASEOUS REACTANTS FOR ADVANCED CHEMICAL LASERS Final Report, 28 Jun. 1974 - 9 Feb. 1975
R. A. Ackerman, R. J. Reiner, and G. Emmanuel Apr. 1975 191 p refs
(Contract N60921-74-C-0372)
(AD-A009879; TRW-26395-6007-RU-00) Avail: NTIS CSCL 20/5

Over four hundred reactant combinations were evaluated for safety, toxicity, handling and expected performance. Sixteen reactants were selected for detailed modeling calculations. Six alternative reactant combinations were characterized for combustion performance. C* efficiency, combustor temperature, carbon production, combustion stability, ignition characteristics and effluent uniformity and composition were obtained. New diagnostic and ignition techniques were developed and proven. Seven combinations of combustor and cavity reactants were modeled. An overall ranking and evaluation of new laser reactant systems are presented. A compendium of kinetic rate constants of importance in chemical laser modeling is included. GRA

N75-31438# United Technologies Research Center, East Hartford, Conn.
INVESTIGATION OF A COMBUSTION-DRIVEN CHAIN-REACTION HCl LASER Final Technical Report
R. A. Meinzer and R. J. Hall May 1975 163 p refs
(Contract N00014-74-C-0377)
(AD-A009854; R75-951895-4) Avail: NTIS CSCL 20/5

A cw combustion-driven HCl laser based on a H_2-ClF chain-reaction was investigated and found to possess attractive characteristics for high power laser operation. Under some operating conditions, this laser simultaneously operates at HCl and HF wavelengths. The maximum power extracted at HCl wavelengths was 300 watts. A variety of operating conditions were evaluated and the results suggest that the optimum performance was obtained with a combustor gas temperature of approximately 1000K. Chemiluminescent emission spectroscopy measurements performed on the active media indicated that total vibrational population inversions were achieved on both HF and HCl transitions. An. iterative comparison was made from which limits were established for mixing rates and for a number of important reactions for which neither rate data nor product distributions existed. With this tuned computer model, the HCl laser is predicted to operate at static pressures in excess of 50 torr so that pressure recovery directly to atmosphere may be possible. GRA

N75-31439# Aerodyne Research, Inc., Burlington, Mass.
AEROSOL ATTENUATION IN THE 2-4 MICROMETER REGION Semiannual Report, 20 May - 20 Nov. 1974
Robert C. Sepucha and David C. Mann Mar. 1975 45 p refs
(Contract F30602-74-C-0282; ARPA Order 1279)
(AD-A009875; ARI-RR-58; RADC-TR-75-113) Avail: NTIS CSCL 20/5

This report describes an experimental facility being constructed to measure the extinction and scattering of DF laser radiation by atmospheric aerosols. The details of the apparatus and the theory of the measurements are presented. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-31440 Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE SYNTHESIS OF FOUR BAR LINKAGE COUPLER CURVES USING DERIVATIVES OF THE RADIUS OF CURVATURE Ph.D. Thesis
Reginald Glennis Mitchiner 1975 257 p
Avail: Univ. Microfilms Order No. 75-18215

Procedures for the synthesis of four-bar kinematic linkages with approximate portions of either coupler point curves specified are developed. The necessary equations are derived and computer programs using these equations which have been integrated into a complete synthesis procedure are set forth. A procedure allowing one degree of freedom in locating the coupler point, such that the zeroes of the first derivative of the radius of curvature are approximated, is presented for the case of an approximately straight coupler point path. Another procedure permitting two degrees of freedom in the coupler point specification is shown for both straight and circular coupler curves. For each synthesis procedure, examples are presented. The computer program listings and sample outputs for each example are shown. Dissert. Abstr.

N75-31441 Florida Univ., Gainesville.
A NON-EQUILIBRIUM ANALYSIS OF THE OTTO CYCLE ENGINE FROM THE VIEWPOINT OF COMBUSTION AND EMISSIONS Ph.D. Thesis
Shesh Krishna Srivatsa 1974 352 p
Avail: Univ. Microfilms Order No. 75-16448

An analytical study of the thermodynamic processes occurring in an Otto cycle engine was conducted with a view to obtaining a better understanding of the combustion process and a realistic prediction of the emission levels. The study presented here has been divided into two parts. A study of the combustion process was carried out by numerically solving the set of partial differential equations governing one-dimensional unsteady laminar flame propagation in a homogeneous fuel-air mixture. A mathematical model for the Otto cycle was developed to predict the thermodynamic properties and the species concentrations throughout the

cycle based on a nonequilibrium analysis and finite rate combustion. The model was used to study the effect of the intake of an additive mixture of water and alcohols (methanol and ethanol) in different proportions and amounts on the emission levels. The model is flexible and permits the study of the influence of other factors such as exhaust gas recirculation, air-fuel ratio, compression ratio, speed, ignition timing, etc., on the performance and emission levels. Dissert. Abstr.

N75-31442 Florida Univ., Gainesville.
SYNTHESIS OF MULTI-LINK MECHANISMS FOR DYNAMIC SPECIFICATIONS Ph.D. Thesis
Arvid Myklebust 1974 208 p
Avail: Univ. Microfilms Order No. 75-16426

A theory is presented for the exact synthesis of five-, six- and higher-link, planar mechanisms for five multiply separated position dynamic specifications (the class of prescribed conditions for synthesis consisting of inertia forces and torques, momenta or combinations of positions and time derivatives up to the fourth order, i.e., velocity, acceleration, jerk and jounce). Certain previously unsolved geometric synthesis problems are solved utilizing this theory. A generalized computer program, MECSYN, is presented for the synthesis of multi-link, planar mechanisms to allow practical use of the theory above in addition to the usual synthesis for geometric specifications. MECSYN is a closed form, noniterative program which uses a modular approach employing four tools for synthesis (constraint link synthesis, inversion, angular cognates, and path cognates) for all possible cases of four and five multiply separated positions. Dissert. Abstr.

N75-31443 Florida Univ., Gainesville.
A STUDY OF THE COMBUSTION PHENOMENA RELATED TO 'KNOCK' FOR A SPARK IGNITION ENGINE OPERATING ON HYDROGEN AND AIR Ph.D. Thesis
James Edward Lenertz 1974 188 p
Avail: Univ. Microfilms Order No. 75-16405

'Knock' in hydrogen fueled spark ignition internal combustion engines occurs at high compression ratios, and water induction controls the knocking with no appreciable loss in maximum power output. Combustion knock is caused by the rapid rate of combustion chamber pressure rise (greater than 50 atm/msec) associated with flame speeds on the order of 300 feet per second. Knock was most severe with fuel rich conditions, at high compression ratios. Compression ratios up to 10.91 were investigated and the fuel was supplied via high pressure tanks and metered into the intake manifold. The single cylinder experimental engine used was operated at full throttle with an engine speed of approximately 1800 RPM for a range of fuel flow rates, water induction rates, and compression ratios. A computer program was developed to predict flame front position based on measured combustion chamber pressure rise data. Dissert. Abstr.

N75-31444 Columbia Univ., New York.
LOGICAL FUNCTIONAL DESIGN AND OPTIMIZATION OF MECHANISMS AND MECHANICAL SYSTEMS Ph.D. Thesis
Eres Soeylemez 1974 512 p
Avail: Univ. Microfilms Order No. 75-16140

Switching theory, network-theory concepts and kinematic developments were used in a systematic study of the logical functional design of mechanical systems. The basic logical functional structure of such systems were determined; the principal mechanical logical variables were identified; and the analysis, synthesis and optimization of the logical function of such systems was described. Certain generalizations were made and the guidelines for a rational approach to logical functional design were formulated. In the second part of the research, optimization of transmission variation of the general, skew four-bar linkage is given. Dissert. Abstr.

N75-31445 North Carolina State Univ., Raleigh.
THE OPTIMUM POCKET GEOMETRY FOR A FINITE HYDRODYNAMIC THRUST BEARING Ph.D. Thesis
Edward Walker Gregory 1975 92 p
Avail: Univ. Microfilms Order No. 75-17099

The pressure distribution of the lubricant within the boundaries of a finite hydrodynamic thrust bearing is calculated in order that a search routine may be employed to determine the pocket geometry which produces maximum load-carrying capacity. The Reynolds equation for an incompressible lubricant of constant viscosity is written in cylindrical coordinates and subjected to approximate solution through finite element numerical methods. The pressure distribution which is thus determined allows the calculation of load-carrying capacity. The optimization technique known as pattern search is applied to the load capacity as a function of the pocket boundary and pocket depth. The optimum pocket geometry, associated two-dimensional pressure distribution, power dissipation, center of pressure, and maximum load capacity are calculated for bearings of various curvature and degree of arc. Dissert. Abstr.

N75-31446* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DRILLED BALL BEARING WITH A ONE PIECE ANTI-TIPPING CAGE ASSEMBLY Patent
Arthur S. Irwin, inventor (to NASA) (Marlin-Rockwell Corp.) Issued 16 Sep. 1975 5 p Filed 12 Mar. 1974 Supersedes N74-18133 (12 - 09, p 1055) Sponsored by NASA
(NASA-Case-LEW-11925-1; US-Patent-3,905,660; US-Patent-Appl-SN-450505; US-Patent-Class-308-191; US-Patent-Class-308-195; US-Patent-Class-308-201) Avail: US Patent Office CSCL 13I

A drilled ball bearing is disclosed which has a pair of projections machined or otherwise formed from the inner surface of each of the cage pockets. These projections prevent misorientation of the openings of the drilled passages of the balls with respect to the surfaces of the inner and outer races. The machining of the projections from the inner surface of each of the cage pockets forms a unitary one piece structure which has improved resistance to fragmentation caused by either thermal or vibrational effects when compared to conventional two piece anti-tipping cage assemblies. Official Gazette of the U.S. Patent Office

N75-31447# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
STRESS WAVE RIVETER SYSTEM ANALYSIS
Basil Leftheris Jul. 1975 76 p refs
(RE-503) Avail: NTIS HC $4.75

The Stress Wave Riveter (SWR) which is a high velocity metal forming tool is described. A stress wave is applied by a rapidly expanding magnetic field through a conducting driver plate to the base of a conical steel mass called the stress wave amplifier. The amplifier increases the stress wave in amplitude and duration so that when the wave passes into a rivet the rivet begins to yield plastically. The relationship is analyzed between the physical properties of the SWR components and the velocity characteristics produced in the workpiece and in the components of the tool. Results show that the measured interactions between the coil, amplifier, and other SWR components can be explained by a relatively straightforward dynamic analysis. The desirable feature of an extended period of nearly constant forming velocity at the rivet interface is achieved in the SWR primarily by ensuring that there is a reasonably good match between two characteristics velocities of the riveter/rivet system. Author

N75-31448*# Santa Clara Univ., Calif.
A MULTILEVEL CONTROL SYSTEM FOR THE LARGE SPACE TELESCOPE Final Report, 20 Jan. 1974 - 1 Jul. 1975
D. D. Siljak, S. K. Sundareshan, and M. B. Vukcevic 31 Jul. 1975 101 p refs
(Contract NAS8-27799)
(NASA-CR-143941) Avail: NTIS HC $5.25 CSCL 14B

A multilevel scheme was proposed for control of Large Space Telescope (LST) modeled by a three-axis-six-order nonlinear equation. Local controllers were used on the subsystem level to stabilize motions corresponding to the three axes. Global controllers were applied to reduce (and sometimes nullify) the interactions among the subsystems. A multilevel optimization method was developed whereby local quadratic optimizations were performed on the subsystem level, and global control was again used to reduce (nullify) the effect of interactions. The multilevel stabilization and optimization methods are presented as general tools for design and then used in the design of the LST Control System. The methods are entirely computerized, so

that they can accommodate higher order LST models with both conceptual and numerical advantages over standard straightforward design techniques. Author

N75-31449# Aeronautical Research Labs., Melbourne (Australia).
CONSTANT VOLUME GAS TURBINE: A DETAILED THERMODYNAMIC ASSESSMENT
M. Zockel Oct. 1974 51 p refs
(ARL/ME-Rept-143) Avail: NTIS HC $4.25

A quasi-steady analysis was used to investigate the thermodynamic advantages of a gas turbine cycle with intermittent, constant volume combustion. The computations incorporate variable specific heat and dissociation during the combustion phase, and the effects of three different turbine characteristics are considered-a hypothetical constant efficiency turbine, a typical multistage axial turbine, and a typical high pressure ratio single stage radial turbine. The investigations include the effect of turbine inlet temperature, compressor pressure ratio, scavenging ratio, finite combustion time, heat exhangers, and part load performance. A section dealing with combustor design variables is also included. The analysis indicates that the constant volume gas turbine has advantages in thermal efficiency, specific power, and part load performance over simple constant pressure gas turbines operating at the same compressor ratio and turbine inlet temperature. The addition of a heat exhanger shows less advantage when applied to a constant volume than to a constant pressure engine, and it is concluded that the potential efficiency of a non-regenerative constant volume gas turbine can be equalled by a constant pressure gas turbine having a simple recuperator of thermal ratio about 0.5. Author

N75-31450# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
BORING OUT OF DEEP HOLES WITHOUT CHATTER [ALESAGE DES TROUS PROFONDS SANS BROUTAGE]
J. Donies and L. VandenNoortgate Jun. 1974 33 p refs In FRENCH
(CRIF-NT-10) Avail: NTIS HC $3.75

A method to increase the dynamic rigidity of the tool rod for deep hole boring and rectifying is presented. The internal profile is made parabolic or approximated to a parabola, and a dynamic vibration damper is incorporated inside the rod. Methods for the calculations of the damper are detailed, four actual examples are worked out. As a result of correct match the vibration resonance is completely eliminated, cutting velocities are restored to normal, and harder tools can be used with considerable increase in surface quality and time saving. ESRO

N75-31451# Pennsylvania State Univ., University Park. Petroleum Refining Lab.
FLUIDS, LUBRICATION, FUELS AND RELATED MATERIALS, PART 1 Annual Report, 1 May 1973 - 30 Apr. 1974
E. Erwin Klaus, Elmer J. Tewksbury, Michael Charles, and Arun Bose Jun. 1974 252 p refs
(Contract F33615-73-C-5101; AF Proj. 7343)
(AD-A009515; AFML-TR-74-201-Pt-1) Avail: NTIS CSCL 11/8

Oxidation studies with a variety of fluids at high temperatures are presented. These studies emphasize the evaluation of oxygen tolerance of the fluids as opposed to conventional tests measuring the stable life or induction period of fluids. Oxygen assimilation rates are measured using gas chromatographic methods. Temperature-programmed gas chromatography using an internal standard is used for the quantitative evaluation of the oxidized product. Temperature measurements are being made for both the liquid and the vapor space in the reaction zone. The effect of the volatility of the fluid and of the volatile oxidation products on the rate of oxygen assimilation is determined. Procedures for the recovery and analysis of the debris formed at the wear surfaces in a four-ball wear tester are presented. A lubrication model based on metal-fluid interaction in the concentrated contact is proposed. Environmental conditions in the concentrated contact are shown to be capable of providing fluid degradation products. A material balance used to quantify the lubrication debris recovered is discussed. Atomic absorption spectrophotometry is used to obtain the metal content of the various fractions of the wear debris. Some preliminary data on the effect of several materials on the wear behavior of steel-on-titanium and titanium-on-titanium are presented. Bulk modulus measurements for some Spec. MIL-H-83282 fluids are given. GRA

N75-31452# Army Materiel Command, Texarkana, Tex. Intern Training Center.
RECLAMATION PROCESSES FOR THE RECOVERY OF PRECIOUS METALS Final Report
Delphine Joseph Rod Apr. 1975 55 p refs
(AD-A009184; USAMC-ITC-02-08-75-217) Avail: NTIS CSCL 13/2

The Fairchild-Hiller Model 1150 incinerator, the Calcinator 10-GSX incinerator and the Atlantic Film Industries: stripper were evaluated on their ability to destroy photographic film and recover silver. The points of evaluation were percentage of silver recovered, cost of operation, and the impact upon the environment. The Fairchild-Hiller Model 1150 recovered a high percentage of the silver available and met all pollution requirements for now and the foreseeable future. The Calcinator 10-GSX incinerator did not have as good a recovery rate as expected and needed additional equipment to meet air pollution standards. The Atlantic Film Industries: stripper recovered a high percentage of silver, but did not declassify the film base and required extensive manhours to operate. GRA

N75-31453# Navy Personnel Research and Development Center, San Diego, Calif.
COMPARISON OF A DISCOVERY AND DIDACTIC STRATEGY FOR RADIOGRAPHIC (X-RAY) INTERPRETATION TRAINING Interim Report, Apr. 1974 - Feb. 1975
Robert G. Wells Apr. 1975 17 p refs
(PF55522004)
(AD-A009236; NPRDC-TR-75-33) Avail: NTIS CSCL 05/9

The objective of this research was to develop and evaluate two audiovisual (A-V) programs designed to teach trainees how to interpret industrial radiographs (X-rays). The first was a didactic program in which the radiographic indications to be learned were accompanied by a verbal presentation pointing out their relevant identification attributes. The other was a discovery program in which these attributes were not given, thus leaving the trainee to discover the basis of identification on his own. One hundred subjects were assigned to either the didactic or discovery condition and put through the appropriate A-V program. Upon completion, the two groups were compared on average test scores and program times. GRA

N75-31454# Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
REPORTS ON APPLICATIONS OF ARPA PLATFORM
Victor C. Anderson 15 Jul. 1971 41 p refs
(Contract N00014-69-A-0200-6002; NR Proj. 260-103; NR Proj. 293-005)
(AD-A009260; MPL-U-18/71; MPL-J-20/71; SIO-Ref-71-20) Avail: NTIS CSCL 13/10

Report of two panels convened by the Marine Physical Laboratory in 1971 for the purpose of examining in detail the prospective application of the proposed Advanced Research Projects Agency (ARPA) stable floating platform to work in the fields of large area surveillance and ocean engineering. Several potential research programs are identified in each field and the impact of these applications on the platform design is indicated. The proposed platform will be useful in the performance of a wide variety of tasks. GRA

N75-31455# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
A COMPUTER MODEL OF STEADY STATE AND TRANSIENT TRACTION FORCES AND ALIGNING MOMENT DEVELOPED BY PNEUMATIC TIRES
Koch Bertil Jan. 1975 158 p refs
(PB-241755/8; UM-HSRI-PF-75-2) Avail: NTIS HC $6.25 CSCL 13F

Data are presented on the development of a semi-empirical tire model which has the capability of simulating steadystate and transient traction forces and aligning moment in response to combined longitudinal and lateral wheel slip. The model recognizes the tire-road friction force as a function of local position and velocity of tread element sliding within the contact region. Examples of steadystate and transient response calculations are

given. Pure-digital and analog-digital (hybrid) computer programs are included. GRA

N75-31456# Aerospace Corp., El Segundo, Calif. Environmental Programs Group.
EVALUATION OF PRECHAMBER SPARK IGNITION ENGINE CONCEPTS Final Report, Dec. 1973 - Jan. 1975
W. U. Roessler and A. Muraszew Feb. 1975 239 p refs
(Grant EPA-R-802499-01)
(PB-241780/6; EPA-650/2-75-023) Avail: NTIS HC $7.50 CSCL 21G

The performance, emission, and operational characteristics of prechamber (or divided chamber), spark ignition engine concepts, including an analysis and evaluation of the applicability of these concepts to new automotive and stationary engines and retrofit installations. Relative to conventional automotive engines, prechamber engines exhibit very low carbon monoxide emissions accompanied by some reduction in the emission of nitrogen oxides. However, the hydrocarbon emission from prechamber engines is similar to that of conventional engines employing non-catalytic emission control systems, indicating a need for aftertreatment devices such as lean thermal reactors of catalytic converters. GRA

N75-31457# Purdue Univ., Lafayette, Ind. Automatic Control Center.
OPTIMIZATION OF AUTOMOTIVE ENGINE EFFICIENCY AND EMISSIONS
R. Prabhakar, R. E. Goodson, and Stephen J. Citron Apr. 1975 31 p refs
(Contract N00014-67-A-0226-0012; NR Proj. 041-423)
(AD-A009897; ACC-75-1; TR-7) Avail: NTIS CSCL 13/6

Experimental curve fitting techniques are used to model engine emissions as a function of engine operating variables. Using this model, the optimal control inputs for a given vehicle and specified test cycle are computed. Air-fuel ratio, spark advance and exhaust gas recirculation were considered as the control variables. The results of this study show that considerable improvement over stock car performance can be obtained if these variables are optimally controlled. GRA

N75-31458# Control Systems Research, Inc., Arlington, Va.
A REMOTELY ACTUATED FLOOR ENGAGEMENT DUNNAGE SYSTEM FOR CONTAINERIZED SHIPMENTS OF HAZARDOUS MATERIALS Final Report
H. Byron and S. Berger Apr. 1975 216 p refs
(Contract DAAK02-74-C-0286)
(AD-A009779) Avail: NTIS CSCL 19/1

This report contains the design for a mechanical dunnage system for high speed loading of ammunition in commercial 20 foot intermodal containers. The kit consists of a steel master pallet which is used to unitize the load prior to load-out. The master pallet includes a subsystem for securing and consolidating the cargo by means of ultra high strength synthetic straps. Engagement to an unmodified commercial container is by curved high strength nails which are hydraulically pressed into the wood floor of the container. Provisions for mobility are also included in the master pallet. This one piece system provides load-out times of under ten minutes per container at less than $2,000 per container. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-31459 Drexel Univ., Philadelphia, Pa.
MODELLING CONCEPTS FOR EVALUATING SELECTED ASPECTS OF ULTRASONIC WAVE INTERACTION WITH AN ADHESIVE BOND Ph.D. Thesis
Paul Aloysius Meyer 1975 121 p
Avail: Univ. Microfilms Order No. 75-18043

Adhesive bondline defects such as chemical segregation, variation in cure, gas entrapment or inadequate surface preparation are responsible for many adhesively bonded structural failures. Analytical models are developed that can be used to relate these flaws to the manner in which they affect the reflection of an ultrasonic pulse from such a bondline. Studies of these models have shown that the ultrasonic reflection variations occur in the form of amplitude changes in the time domain and spectral shifts in the frequency domain. In addition to the development of the bond models, other results include: (1) the demonstration of the need for careful experimentation when ultrasonically inspecting adhesive bonds; (2) the determination of surface preparation quality in assembled bonds using the ultrasonic pulse-echo inspection technique; and (3) a discussion of the possible problems associated with the detection of environmental degradation of adhesive bonds due to moisture absorption.
Dissert. Abstr.

N75-31460 Texas Univ., Austin.
DEVELOPMENT OF FAULT TOLERANT FUNCTIONAL DEVICES Ph.D. Thesis
Eldon Wedgworth Husband 1975 188 p
Avail: Univ. Microfilms Order No. 75-16686

Techniques and hardware design for improving the fault tolerance of several digital devices were developed. Methods for integrating these devices into a fault tolerant system were studied. Results of study were: (1) development of a combinational ripple carry adder that can be fully tested for single faults with a test sequence of only eight patterns; (2) a parity checker/generator with built-in-test circuitry of about 10 percent of the original circuitry that can detect all external pin faults and 70 percent of all faults; (3) test patterns for testing a decoder and a simple technique for reducing the failure modes of a decoder to two modes which are easily detectable; (4) design of a cost effective ultrareliable semiconductor memory system; (5) cost effectiveness of including redundant circuitry within a semiconductor device; and (6) a fault tolerant processor utilizing many of the devices and techniques developed in the study.
Dissert. Abstr.

N75-31461*# General Dynamics/Fort Worth, Tex. Materials Research Lab.
ASSESSMENT OF NDE RELIABILITY DATA Technical Report, Jul. - Dec. 1974
B. G. W. Yee, J. C. Couchman, F. H. Chang, and D. F. Packman (Vanderbilt Univ.) Sep. 1975 84 p
(Contract NAS3-18907)
(NASA-CR-134834; YHG-6780) Avail: NTIS HC $4.75 CSCL 14D

Twenty sets of relevant nondestructive test (NDT) reliability data were identified, collected, compiled, and categorized. A criterion for the selection of data for statistical analysis considerations was formulated, and a model to grade the quality and validity of the data sets was developed. Data input formats, which record the pertinent parameters of the defect/specimen and inspection procedures, were formulated for each NDE method. A comprehensive computer program was written and debugged to calculate the probability of flaw detection at several confidence limits by the binomial distribution. This program also selects the desired data sets for pooling and tests the statistical pooling criteria before calculating the composite detection reliability. An example of the calculated reliability of crack detection in bolt holes by an automatic eddy current method is presented. Author

N75-31462# Societe Europeenne de Propulsion, Bordeaux (France).
TESTS OF TWO QUALIFIED HYDRAZINE BUTTERFLY VALVES [EXPERTISE DES DEUX VANNES A HYDRAZINE QUALIFIEES DANS LE CADRE DU CONTRAT 1713/72/HP]
G. Vautre and J. C. Rigal 16 Jan. 1974 85 p refs In FRENCH
(Contract ESTEC-2055/73-HP)
(SEP-TS/SE-43181/73; ESRO-CR(P)-522) Avail: NTIS HC $4.75

The results of performance/durability tests on two qualified hydrazine electro valves are reported, and methods and experimental set up outlined. The test results are detailed with regard to piston displacement stiffness and forces applied, surface defects,

filter pollution, and electrical wiring. Failure reports are detailed and proposed corrective actions are discussed. ESRO

N75-31463# Army Materiel Command, Texarkana, Tex. Intern Training Center.
AN ANALYSIS OF THE CONCEPT OF TIME BETWEEN OVERHAUL LIMITS FOR AIRCRAFT COMPONENTS Final Report
John Thomas Stanfield, Jr. Mar. 1975 61 p refs
(AD-A009187; USAMC-ITC-02-08-75-226) Avail: NTIS CSCL 01/3

This report investigates the concept of scheduling aircraft component replacements on the basis of time between overhaul (TBO) limits. The conditions under which the use of a TBO limit can be justified are examined. Statistical and reliability theories applicable to planned replacement programs are studied. Component failure characteristics assumed by classical reliability theory are compared with actual failure data for various types of aircraft components. Finally, recommendations are presented for developing and managing a component TBO program. GRA

N75-31464# Army Materiel Command, Texarkana, Tex. Intern Training Center.
A COMPARATIVE ANALYSIS OF RELIABILITY PREDICTION TECHNIQUES Final Report
Douglas Joseph McGowen Apr. 1975 92 p refs
(AD-A009282; USAMC-ITC-02-08-75-103) Avail: NTIS CSCL 14/4

The report describes various reliability prediction techniques utilized in the development of an equipment. The techniques described include prediction by similar system, similar complexity, function, generic part count, stress analysis, and degradation techniques. These are described and compared with respect to the characteristics, basic assumptions, typical applications, and relative accuracy. GRA

N75-31465# IIT Research Inst., Chicago, Ill.
SOLDER CRACKING STUDY Final Technical Report, Mar. 1973 - Sep. 1974
E. R. Bangs and R. E. Beal Mar. 1975 69 p
(Contract F30602-73-C-0171; AF Proj. 62702F)
(AD-A010471; IITRI-C21356; RADC-TR-75-67) Avail: NTIS CSCL 09/5

The program involved the effect on joints when exposed to low-frequency thermal cycling and a definition of the metallurgical cracking mechanism. Four solder alloys (50Sn-50Pb, 63Sn-37Pb, 70Sn-30Pb, and 40Sn-60Pb) were exposed to low-frequency thermal cycles. Sample soldered joints on printed circuit boards were installed in an environmental test chamber and subjected to thermal cycling. An exhaustive study was performed on the tested soldered joints to detect any metallurgical changes resulting from testing and to define the metallurgical mechanism of solder failure. Examinations consisted of bright-light microscopy and scanning electron microscopy on soldered fillet faces, joint cross-sections, and fractured surfaces. GRA

N75-31466# Army Materiel Command, Texarkana, Tex. Intern Training Center.
A SURVEY OF EXISTING MEANS FOR PREDICTION OF FATIGUE LIFE Final Report
Thomas Charles Schwake Mar. 1975 92 p refs
(AD-A009406; USAMC-ITC-02-08-75-219) Avail: NTIS CSCL 20/11

The object of this research is to explore new areas for the prediction of fatigue properties of materials. Both the inherent flaw theory and the finite crack theory were explored in some detail. The major theory considered in the area of inherent flaws was the Bement-Pohler Fatigue Theory. The Structural-Energy Theory along with several crack propagation laws were presented in the chapter dealing with the finite crack theory. Some very promising results were found. With some further testing, these new methods could substantially reduce the cost of establishing a material's fatigue properties. In the conclusions several areas are discussed in which further experimentation is needed. References are made throughout the paper to these areas and their present inadequacies. GRA

N75-31467# Army Materiel Command, Texarkana, Tex. Intern Training Center.
COMPARISON OF MAXIMUM LIKELIHOOD AND LEAST SQUARES CUMULATIVE ESTIMATORS FOR THE GOMPERTZ-MAKEHAM HAZARD RATE FUNCTION Final Report
Richard Earl Sackett Apr. 1975 140 p refs
(AD-A009410; USAMC-ITC-02-08-75-003) Avail: NTIS CSCL 14/4

This research investigates the use of the cumulative distribution function and least squares analysis for estimating the three parameters of the hazard function, b - k(e sup(-at)). The least squares cumulative (LSC) estimators of the parameters are obtained by solving a system of nonlinear equations using the gradient method of Fletcher-Powell. The small sample property of the estimator is analyzed in a two-way comparison. Through Monte-Carle simulation, sample data sets with five to twenty-five time-to-failure data points are generated by assuming parameter values. The failure times are used as inputs to the LSC program and the resulting estimates are compared to maximum likelihood estimates. GRA

N75-31468# Martin Marietta Aerospace, Orlando, Fla.
MAINTAINABILITY ENGINEERING DESIGN NOTEBOOK, REVISION 2, AND COST OF MAINTAINABILITY, VOLUME 3 Final Report
Lyle R. Greenman Jan. 1975 459 p ref
(Contract F30602-73-C-0201)
(AD-A009045; RADC-TR-74-308-Vol-3; FR-34) Avail: NTIS CSCL 15/5

This chapter contains a detailed description of the tasks required to develop a maintainability demonstration plan, with guidelines and methodology for preparing the plan, test methods that are used in maintainability demonstration tests, procedures for preparing a test plan, an example of a test plan, and an example of the documentation which requires a test plan to be prepared. Nine primary test methods, taken from MIL-STD-471 and 471A are described in this chapter. The last section (15E7) provides a simplified procedure and example of computing all the sample size and accept/reject criteria calculations for each method. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N75-31469 Wisconsin Univ., Madison.
ELASTIC SYSTEMS MOVING ON A BEAM SUPPORTED BY SOIL OR FLUID FOUNDATION Ph.D. Thesis
Vikrambhai Naginbhai Shah 1974 399 p
Avail: Univ. Microfilms Order No. 75-10001

The soil foundation is simulated by a multilayered inertial elastic foundation. A beam supported by this foundation is represented as a layered beam system. The natural frequencies and mode shapes are obtained by two different methods -- the state-space method and the power series method. The orthogonality and normalizing conditions are derived for these mode shapes and applied to develop the equations for the forced vibrations. For numerical examples, the dynamic response of a beam supported by a two layered, inertial foundation subjected to moving loads is analyzed. The moving loads include a concentrated force, a point mass or a spring-mass-damper system. The problem of a two dimensional elastic system moving on a beam supported by elastic foundation is included. The moving system is supported by the suspension units. Dissert. Abstr.

N75-31470 Columbia Univ., New York.
STRESS IN A SUSPENSION NEAR RIGID BOUNDARIES Ph.D. Thesis
Aydin Tozeren 1974 126 p
Avail: Univ. Microfilms Order No. 75-16145

The stress system near a rigid boundary in a suspension of

rigid spheres is considered under the assumption of small Reynolds number. The ambient fluid is taken to be Newtonian and incompressible. An ergodic principle is formulated for parallel mean flows, and the mean stress is expressed as a surface average over the instantaneous stress distribution. This mean stress is shown to reduce to the Einstein value where the distance from the boundary is large enough to make the boundary effects negligible. Only dilute suspensions are considered. A uniform shear flow past a plane wall was studied for a single particle and for suspensions. A solution by separation of variables is developed for the slow viscous motion of the fluid in the presence of a force-free sphere near the plane wall. Computations are carried out for a force-free and couple-free sphere and also for spheres with couples applied by external means. Velocity profiles of the suspension for Couette flow and Poiseuille flow are developed. Dissert. Abstr.

N75-31471 Florida Univ., Gainesville.
ON THE AUTOMATED OPTIMAL DESIGN OF CONSTRAINED STRUCTURES Ph.D. Thesis
Jerry C. Hornbuckle 1974 265 p
Avail: Univ. Microfilms Order No. 75-16395

Pontryagin's maximum principle is applied to the optimal design of elastic structures, subject to both hard inequality constraints and subsidiary conditions. By analyzing the maximum principle as a nonlinear programming problem, an explicit formulation is derived for the Lagrangian multiplier functions that adjoin the constraints to the cost functional. With this result the usual necessary conditions for optimality can themselves be used directly in an algorithm for obtaining a solution. A survey of general methods and problems in the optimal design of elastic structures shows that there are two general problem types depending upon whether or not the cost functional is an eigenvalue. An example problem of each type is included with the solutions obtained by the method of quasilinearization. In order to demonstrate the theory for the programming techniques used, the beam problem is also solved by using a finite element representation of the structure. Dissert. Abstr.

N75-31472 California Univ., Los Angeles.
THE MOTION OF INTERCONNECTED FLEXIBLE BODIES Ph.D. Thesis
Arthur Stewart Hopkins 1975 242 p
Avail: Univ. Microfilms Order No. 75-16785

The equations of motion for an arbitrarily interconnected collection of substructures are derived. The substructures are elastic bodies which may be idealized as finite element assemblies. The substructures are subject to small deformations relative to a nominal state. Interconnections between the elastic substructures permit large relative translations and rotations between substructures, governed by Pfaffian constraints describing the connections. In the special case of screw connections (permitting rotation about and translation along a single axis), constraint forces are eliminated and modal coupling is incorporated. Dissert. Abstr.

N75-31473 Florida Univ., Gainesville.
AN INVESTIGATION OF THE STRENGTH OF CONCRETE MASONRY SHEAR WALL STRUCTURES Ph.D. Thesis
Krishnaiyer Balachandran 1974 251 p
Avail: Univ. Microfilms Order No. 75-16350

The main objective is to obtain empirical equations to predict the shear capacity of nonreinforced concrete masonry elements. First, an experimental program was initiated to obtain equations for predicting the strength of mortar joints under combined compression, shear, and bending. The test specimens were standard three-block prisms with three-eighths-inch mortar joints. Precompression up to 300 psi was applied. Based on test results, a circular interaction curve is proposed for predicting the strength of mortar joints under combined stresses. In the second phase of the experimental program, the shear strength of concrete masonry piers made with one-fourth scale model blocks was investigated. A nonlinear finite element analysis, using the isoparametric approach and higher order rectangular elements, was developed to predict the behavior and collapse of concrete masonry elements. Dissert. Abstr.

N75-31474 Virginia Polytechnic Inst. and State Univ., Blacksburg.
PLASTIC/ELASTIC TORSION OF NON-UNIFORM AND NON-HOMOGENEOUS BARS Ph.D. Thesis
Rafik Youssef Itani 1975 158 p
Avail: Univ. Microfilms Order No. 75-18213

A numerical approach for solving the elastic-plastic torsion of uniform, nonuniform, homogeneous and nonhomogeneous bars is presented. Nonuniform bars are restricted to being axisymmetric about the axes of the bar. The developed method uses finite elements and a minimum rate principle of plasticity to provide a complete stress history under the action of a quasi-static, monotonically increasing angle of twist. The solution of the minimum rate principle reduces to a problem in quadratic programming. Five example problems are solved and comparisons with available solutions are made. These example problems include a cylinder of constant diameter, a circumferentially notched cylinder, a nonuniform cylindrical bar, a uniform nonhomogeneous bar and a nonuniform nonhomogeneous bar. The developed method is shown to be quite general and to provide good comparisons with available numerical and theoretical solutions. Dissert. Abstr.

N75-31475 Georgia Inst. of Tech., Atlanta.
VIBRATION OF A CRACKED PLATE Ph.D. Thesis
Cornelis Adriaan Lukaart 1975 96 p
Avail: Univ. Microfilms Order No. 75-17489

Procedures for analyzing the vibration of cracked plates and the difficulties encountered in developing analyses representing the behavior involved in an acceptable manner are discussed. An approximate plate theory analysis based on an assumed modes approach is developed and evaluated. The assumed modes are constructed to satisfy geometric boundary conditions and to incorporate the proper order of crack tip singularity. Optimization of the composition of the model components is accomplished by the use of Lagrange equations. Both global and local aspects of the analytical results are examined. Predicted global properties are evaluated by comparison with experimental results obtained for a cracked sheet. The acceptability within the framework of thin plate theory is checked by determining the error in satisfying the moment free conditions on the crack faces. By applying the method on a circular plate it is investigated how convergence is enhanced by an increase in the number of assumed mode functions. Dissert. Abstr.

N75-31476 Georgia Inst. of Tech., Atlanta.
MINIMUM WEIGHT DESIGN OF STIFFENED CIRCULAR CYLINDRICAL SHELLS SUBJECT TO UNIFORM HYDROSTATIC PRESSURE Ph.D. Thesis
Mohan Aswani 1975 207 p
Avail: Univ. Microfilms Order No. 75-17485

A methodology is developed by which minimum weight design of stiffened cylinders under hydrostatic pressure may be achieved. The precise statement of the problem is: given a stiffened cylinder of specified material, radius, and length, find the size, shape, spacing of stiffeners, and the thickness of the skin, such that it can carry safely a hydrostatic pressure with minimum weight. Behavioral constraints include: general instability, panel instability, local instabilities of skin and stiffeners and the limitation on stress levels in various components of the cylinder. Unconstrained minimization of the objective function (defining weight of the cylinder and including one active constraint as penalty function) is performed using a mathematical search technique. This yields a design space in which all the configurations satisfy the mode of failure that has been included in the objective function. The design space is used in arriving at final minimum weight configuration satisfying all the remaining constraints. A systematic procedure is given for accomplishing the design. Dissert. Abstr.

N75-31477 Columbia Univ., New York.
THE EFFECT OF VISCOSITY ON THE DYNAMICS OF A SPHERICAL SHELL IMMERSED IN A FLUID MEDIUM Ph.D. Thesis
Tsung-chow Joe Su 1974 85 p
Avail: NTIS Avail: Univ. Microfilms Order No. 75-16142

In order to clarify the effect of fluid viscosity on the vibrations of submerged elastic shells, the axisymmetric vibrations of a spherical shell immersed in a compressible viscous fluid medium

are studied. The dynamic response of the shell is determined by the classical normal mode method, while a boundary layer approximation is employed for the fluid medium. The study of free oscillations reveals that fluid viscosity may produce noticeable effects on the damping components of the complex natural frequencies and is particularly important for the nonradiating modes. For forced vibrations, it is concluded that the contribution of viscous effect is of small order, except possibly in the vicinity of the peak shell responses when the forcing frequency is near to one of the real components of the natural frequencies.
Dissert. Abstr.

N75-31478 Purdue Univ., Lafayette, Ind.
A STUDY OF THE BEHAVIOR OF STIFFENED TUBULAR T-JOINTS Ph.D. Thesis
Gerald Rolland Frederick 1974 198 p
Avail: Univ. Microfilms Order No. 75-17197

A method is presented for determining the distribution of tractions between a gusset plate and its main member in a planar stiffened tubular joint. The secondary members are assumed to be welded to the gusset plate only and not interwelded to each other or to the main member. The distribution of tractions is determined by constructing a Fourier series so that the deformation of the main member and the gusset plate are compatible. The deformation of the main member is obtained using cylindrical shell theory, and the gusset plate is assumed to be rigid.
Dissert. Abstr.

N75-31479*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VARYING DENSITY COMPOSITE STRUCTURE Patent Application
Harv Linebarier, inventor (to NASA) (Martin Marietta Corp., Denver) Filed 25 Apr. 1975 9 p
(Contract NAS1-9000)
(NASA-Case-LAR-11181-1; US-Patent-Appl-SN-571816) Avail: NTIS HC $3.25 CSCL 20K

An apparatus is disclosed which has a cellular core filled with material formed into stratified layers of varying density. The thermal, acoustic, or aesthetic characteristics of the composite structure thus produced may be tailored to suit a variety of design conditions. The method for producing the variable density composite structure is described.
NASA

N75-31480*# Grumman Aerospace Corp., Bethpage, N.Y.
MODAL COUPLING PROCEDURES ADAPTED TO NASTRAN ANALYSIS OF THE 1/8-SCALE SHUTTLE STRUCTURAL DYNAMICS MODEL. VOLUME 1: TECHNICAL REPORT Final Report
J. Zalesak Jul. 1975 175 p refs
(NASA-CR-132666) Avail: NTIS HC $6.25 CSCL 22B

A dynamic substructuring analysis, utilizing the component modes technique, of the 1/8 scale space shuttle orbiter finite element model is presented. The analysis was accomplished in 3 phases, using NASTRAN RIGID FORMAT 3, with appropriate Alters, on the IBM 360-370. The orbiter was divided into 5 substructures, each of which was reduced to interface degrees of freedom and generalized normal modes. The reduced substructures were coupled to yield the first 23 symmetric free-free orbiter modes, and the eigenvectors in the original grid point degree of freedom lineup were recovered. A comparison was made with an analysis which was performed with the same model using the direct coordinate elimination approach. Eigenvalues were extracted using the inverse power method.
Author

N75-31481*# Grumman Aerospace Corp., Bethpage, N.Y.
MODAL COUPLING PROCEDURES ADAPTED TO NASTRAN ANALYSIS OF THE 1/8-SCALE SHUTTLE STRUCTURAL DYNAMICS MODEL. VOLUME 2: SUPPORTING DATA Final Report
J. Zalesak Jul. 1975 392 p
(Contract NAS1-10635)
(NASA-CR-132667) Avail: NTIS HC $10.25 CSCL 20K

Appendices are presented to a dynamic substructuring analysis of the 1/8 scale space shuttle orbiter finite element model. For Volume 1, see N75-31480.
M.J.S.

N75-31482*# Kanner (Leo) Associates, Redwood City, Calif.
ACQUISITION AND DIGITAL PROCESSING OF ENVIRONMENTAL DATA
J. M. Bouquin Washington NASA Sep. 1975 43 p refs Transl. into ENGLISH of conf. paper ESRO-SP-99, Paris Presented at 3d Testing Symp. Frascati, Italy, Oct. 1973 p 581-602
(Contract NASw-2790)
(NASA-TT-F-16544; ESRO-SP-99) Avail: NTIS HC $3.75 CSCL 20K

The environmental data processed include time variable signals measured on structures subjected to vibrational environments. The data processing consists of two phases: (1) the acquisition phase and (2) the analysis phase. Three types of signal are considered: (1) sinusoidal signals, (2) random signals, and (3) transient signals. Acquisition methods for these signals are presented as well as digital analysis methods which include the digital filtering technique and the Fast Fourier Transformation technique.
Author

N75-31483*# MacNeal-Schwendler Corp., Los Angeles, Calif.
NASTRAN MODIFICATIONS FOR RECOVERING STRAINS AND CURVATURES Final Report
Carl W. Hennrich Mar. 1975 59 p ref
(Contract NAS3-18899)
(NASA-CR-134794; EC-296-2) Avail: NTIS HC $4.25 CSCL 20K

Modifications to the NASTRAN structural analysis computer program are described. The modifications allow the recovery of strain and curvature data for the general two-dimensional elements, in addition to the usual stress data. Option features allow the transformation of the strain/curvature (or stress) data to a common coordinate system and representation at the grid points of the structural model rather than at the conventional element center locations. Usage information is provided which will allow present users of NASTRAN to easily utilize the new capability.
Author

N75-31484*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
ISOFINEL: ISOPARAMETRIC FINITE ELEMENT CODE FOR ELASTIC ANALYSIS OF TWO-DIMENSIONAL BODIES Annual Status Report
C. Marino Sep. 1975 67 p refs
(Grant NGR-39-087-053)
(NASA-CR-143498; SM-75-4) Avail: NTIS HC $4.25 CSCL 20K

A formulation is presented for the development of a finite element program for the elastic analysis of two-dimensional bodies using the eight-node isoparametric quadrilateral. The program solves for both plane stress and plane strain problems. The finite element formulation based on the isoparametric displacement functions is presented. The program structure is given in the form of flow diagrams with descriptions of the numerical procedure used to obtain the element stiffness matrix, and the solution method employed to solve for nodal displacements. Three numerical examples (a plate under uniaxial tension, a plate under pure shear, and a beam under pure bending) are presented to illustrate the capability and limitations of the element implementation. The first problem is solved exactly by the element, as predicted by the form of its displacement functions. In the other two problems the accuracy of the solution is highly dependent upon the slenderness of the element, the number of elements in the map, and the numerical integration scheme used to build the element stiffness matrix.
Author

N75-31485*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASTRAN: USER'S EXPERIENCES
Washington Sep. 1975 621 p refs Colloq. held at Hampton, Va., 9-11 Sep. 1975
(NASA-TM-X-3278; L-10436) Avail: NTIS HC $15.25 CSCL 20K

Papers given at the colloquium are presented. Topics discussed include NASTRAN status and plans, computer operations, thermal analysis, NASTRAN applications, vibrations, dynamics, and finite element analysis. For individual titles, see N75-31486 through N75-31523.

N75-31486* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASTRAN STATUS AND PLANS
Deene J. Weidman *In its* NASTRAN: Users' Experiences Sep. 1975 p 1-10 refs (For availability see N75-31485 22-39)
CSCL 20K

Current status and future NASA plans for the NASTRAN program are presented and discussed. Information is also presented to indicate the extent of NASTRAN use throughout the world. Author

N75-31487* Computer Sciences Corp., Silver Spring, Md.
A SURVEY OF NASTRAN IMPROVEMENTS SINCE LEVEL 15.5
John R. McDonough *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 11-22 refs (For availability see N75-31485 22-39)

Several improvements and capabilities were developed and installed in intermediate levels and are being analyzed and evaluated. A survey of current improvements to the program is presented which includes static analysis with differential stiffness rigid format, normal modes with differential stiffness rigid format, the TRIAAX and TRAPAX elements, the CNGRNT feature, fully stressed design, element strain energy and grid point force balance, and complex modal displacement plots. Author

N75-31488* Sperry Rand Corp., Huntsville, Ala.
NASTRAN MAINTENANCE AND ENHANCEMENT EXPERIENCES
Ronald P. Schmitz *In* NASA. Langley Res. Center NASTRAN: Users' Experiences refs (For availability see N75-31485 22-39)

The current capability is described which includes isoparametric elements, optimization of grid point sequencing, and eigenvalue routine. Overlay and coding errors were corrected for cyclic symmetry, transient response, and differential stiffness rigid formats. Error corrections and program enhancements are discussed along with developments scheduled for the current year and a brief description of analyses being performed using the program. Author

N75-31489* Prototype Development Associates, Inc., Santa Ana, Calif.
NASTRAN AS A RESOURCE IN CODE DEVELOPMENT
E. L. Stanton, L. M. Crain, and T. F. Neu (NADC) *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 37-63 refs (For availability see N75-31485 22-39)
(Contract N62269-73-C-0736)
CSCL 20K

A case history is presented in which the NASTRAN system provided both guidelines and working software for use in the development of a discrete element program, PATCHES-111. To avoid duplication and to take advantage of the wide spread user familiarity with NASTRAN, the PATCHES-111 system uses NASTRAN bulk data syntax, NASTRAN matrix utilities, and the NASTRAN linkage editor. Problems in developing the program are discussed along with details on the architecture of the PATCHES-111 parametric cubic modeling system. The system includes model construction procedures, checkpoint/restart strategies, and other features. Author

N75-31490* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NASTRAN SOLUTIONS OF PROBLEMS DESCRIBED BY SIMULTANEOUS PARABOLIC DIFFERENTIAL EQUATIONS
J. B. Mason and W. H. Walston, Jr. (Md. Univ.) *In its* NASTRAN: Users' Experiences Sep. 1975 p 65-90 refs (For availability see N75-31485 22-39)
CSCL 20K

NASTRAN solution techniques are shown for a numerical analysis of a class of coupled vector flow processes described by simultaneous parabolic differential equations. To define one physical problem type where equations of this form arise, the differential equations describing the coupled transfers of heat and mass in mechanical equilibrium with negligible mass average velocity are presented and discussed. Also shown are the equations describing seepage when both electrokinetic and hydrodynamic forces occur. Based on a variational statement of the general problem type, the concepts of scalar transfer elements and parallel element systems are introduced. It is shown that adoption of these concepts allows the direct use of NASTRAN's existing Laplace type elements for uncoupled flow (the heat transfer elements) for treating multicomponent coupled transfer. Sample problems are included which demonstrate the application of these techniques for both steady-state and transient problems. Author

N75-31491* Boeing Commercial Airplane Co., Seattle, Wash.
NASTRAN APPLICATIONS TO AIRCRAFT PROPULSION SYSTEMS
John L. White and David L. Beste *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 91-104 refs (For availability see N75-31485 22-39)

The use of NASTRAN in propulsion system structural integration analysis is described. Computer support programs for modeling, substructuring, and plotting analysis results are discussed. Requirements on interface information and data exchange by participants in a NASTRAN substructure analysis are given. Static and normal modes vibration analysis results are given with comparison to test and other analytical results. Author

N75-31492* Naval Weapons Center, China Lake, Calif.
MODELING DAMAGED WINGS: ELEMENT SELECTION AND CONSTRAINT SPECIFICATION
W. J. Stronge *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 105-119 ref (For availability see N75-31485 22-39)

The NASTRAN analytical program was used for structural design, and no problems were anticipated in applying this program to a damaged structure as long as the deformations were small and the strains remained within the elastic range. In this context, NASTRAN was used to test three-dimensional analytical models of a damaged aircraft wing under static loads. A comparison was made of calculated and experimentally measured strains on primary structural components of an RF-84F wing. This comparison brought out two sensitive areas in modeling semimonocoque structures. The calculated strains were strongly affected by the type of elements used adjacent to the damaged region and by the choice of multipoint constraints sets on the damaged boundary. Author

N75-31493* Exxon Research and Engineering Co., Florham Park, N.J.
APPLICATION OF NASTRAN TO A FLUID SOLIDS UNIT IN THE PETROLEUM INDUSTRY
Norman W. Nelson *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 121-136 (For availability see N75-31485 22-39)

The application of NASTRAN to the design of a fluid solids unit plenum/cyclone/dipleg assembly is described. The major loads considered are thermal, pressure, and gravity. Such applications are of interest in the petroleum industry since the equipment described is historically critical. Author

N75-31494* Grumman Aerospace Corp., Bethpage, N.Y.
SHUTTLE WING PANEL STABILITY ANALYSIS
T. Balderes, P. Mason, E. Ranalli, J. Zalesak, and A. Levy *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 137-169 refs (For availability see N75-31485 22-39)

The use of the NASTRAN program in the shuttle wing stability analysis is described, and details of the actual structure, the finite element idealization, and the NASTRAN results are given. A comparison of the NASTRAN results with those obtained with another computer program and with hand generated results indicates good agreement. An alternate approach for solving eigenvalue problems is illustrated and shows a considerable savings in computer time. Some emphasis is placed on the relationship of the NASTRAN analysis in the design process bringing out more clearly the contribution of the results and showing the importance of the mode plots. A deficiency in the NASTRAN plate elements when used to model structures made up of intersecting plates is discussed. Author

N75-31495* Goodrich (B. F.) Co., Akron, Ohio.
PRESSURE DEFORMATION OF TIRES USING DIF-

FERENTIAL STIFFNESS FOR TRIANGULAR SOLID-OF-REVOLUTION ELEMENTS
C. H. S. Chen *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 171-179 refs (For availability see N75-31485 22-39)

The derivation is presented of the differential stiffness for triangular solid of revolution elements. The derivation takes into account the element rigid body rotation only, the rotation being about the circumferential axis. Internal pressurization of a pneumatic tire is used to illustrate the application of this feature. Author

N75-31496* Lockheed-Georgia Co., Marietta.
A FAILSAFE ANALYSIS USING NASTRAN'S PIECEWISE LINEAR ANALYSIS AND A NINE NODE LINEAR CRACK ELEMENT
R. F. Wilkinson and J. W. Kelley *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 181-200 refs (For availability see N75-31485 22-39)

A two-dimensional crack element was implemented into NASTRAN as a user dummy element and used to study failsafe characteristics of the C5A fuselage. The element is formulated from Reitsner's functional requiring that it satisfy compatability with the linear boundary displacement elements in NASTRAN. Its accuracy is demonstrated by analyzing for the stress intensity factors of two simple crack configurations for which there are classic solutions. Author

N75-31497* Nebraska Univ., Lincoln.
APPLICATION OF NASTRAN FOR STRESS ANALYSIS OF LEFT VENTRICLE OF THE HEART
Y. C. Pao, E. L. Ritman (Mayo Graduate School of Med.), and H. C. Wang (IBM Corp.) *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 201-219 refs (For availability see N75-31485 22-39)
(Grants HL-4664; HL-3532)

Knowing the stress and strain distributions in the left ventricular wall of the heart is a prerequisite for the determination of the muscle elasticity and contractility in the process of assessing the functional status of the heart. NASTRAN was applied for the calculation of these stresses and strains and to help in verifying the results obtained by the computer program FEAMPS which was specifically designed for the plane-strain finite-element analysis of the left ventricular cross sections. Adopted for the analysis are the true shape and dimensions of the cross sections reconstructed from multiplanar X-ray views of a left ventricle which was surgically isolated from a dog's heart but metabolically supported to sustain its beating. A preprocessor was prepared to accommodate both FEAMPS and NASTRAN, and it has also facilitated the application of both the triangular element and isoparameteric quadrilateral element versions of NASTRAN. The stresses in several crucial regions of the left ventricular wall calculated by these two independently developed computer programs are found to be in good agreement. Such confirmation of the results is essential in the development of a method which assesses the heart performance. Author

N75-31498* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DYNAMIC SUBSTRUCTURE ANALYSIS OF THE INTERNATIONAL ULTRAVIOLET EXPLORER (IUE) SPACECRAFT
William R. Case *In its* NASTRAN: Users' Experiences Sep. 1975 p 221-248 refs (For availability see N75-31485 22-39)
CSCL 22B

The results are presented of a steady state vibration analysis of the IUE spacecraft simulating its sinusoidal vibration test. The model of the spacecraft, including solar arrays and the scientific instrument, consisted of three separate substructure models one of which was used to represent the two identical solar arrays. Substructuring techniques were used since the large overall size of the problem precluded solving it utilizing a single model. The models used for each substructure are discussed, including reduction to an acceptable size for the combined dynamic analysis. The DMAP alters needed for performing the modal analysis and the subsequent modal frequency response and substructure data recovery are included. Comparison of the results with data obtained during vibration tests of the spacecraft are also included. Author

N75-31499* Argonne National Lab., Ill.
ANALYTICAL AND EXPERIMENTAL STUDY OF TWO CONCENTRIC CYLINDERS COUPLED BY A FLUID GAP
T. M. Mulcahy, P. Turula, H. Chung, and J. A. Jendrzejczyk *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 249-257 refs (For availability see N75-31485 22-39)

From a structural point of view a liquid coolant type nuclear reactor consists of a heavy steel vessel containing the core and related mechanical components and filled with a hot fluid. This vessel is protected from the severe environment of the core by a shielding structure, the thermal liner, which is usually a relatively thin steel cylinder concentric with the reactor vessel and separated from it by a gap filled with the coolant fluid. This arrangement leads to a potential vibration problem if the fundamental frequency, or one of the higher natural vibration frequencies, of this liner system is close to the frequency of some vibration source present in the reactor vessel. The shell rigidly clamped at its base and free at the top was investigated since it is a better description of the conditions encountered in typical reactor designs. Author

N75-31500* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASTRAN NONLINEAR VIBRATION ANALYSIS OF BEAM AND FRAME STRUCTURES
Chuh Mei (LTV Aerospace Corp.) and James L. Rogers, Jr. *In its* NASTRAN: Users' Experiences' Sep. 1975 p 259-284 refs (For availability see N75-31485 22-39)
CSCL 20K

A capability for the nonlinear vibration analysis of beam and frame structures suitable for use with NASTRAN level 15.5 is described. The nonlinearity considered is due to the presence of axial loads induced by longitudinal end restraints and lateral displacements that are large compared to the beam height. A brief discussion is included of the mathematical analysis and the geometrical stiffness matrix for a prismatic beam (BAR) element. Also included are a brief discussion of the equivalent linearization iterative process used to determine the nonlinear frequency, the required modifications to subroutines DBAR and XMPLBD of the NASTRAN code, and the appropriate vibration capability, four example problems are presented. Comparisons with existing experimental and analytical results show that excellent accuracy is achieved with NASTRAN in all cases. Author

N75-31501* Computer Sciences Corp., Hampton, Va. System Sciences Div.
ON EIGENVECTORS OF MULTIPLE EIGENVALUES OBTAINED IN NASTRAN
P. R. Pamidi and W. K. Brown *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 285-300 refs (For availability see N75-31485 22-39)

In the case of nonmultiple eigenvalues, each of the three real eigenvalue extraction methods available in NASTRAN will, for a given type of normalization, give essentially the same eigenvectors, but this is not so in the case of multiple eigenvalues. This discrepancy is explained and illustrated by considering the example of a NASTRAN demonstration problem that has both multiple and nonmultiple eigenvalues. Author

N75-31502* Boeing Aerospace Co., Seattle, Wash.
THE EFFECTS OF LOCALIZED DAMPING ON STRUCTURAL RESPONSE
D. H. Merchant, R. M. Gates, M. W. Ice, and J. W. VanDerlinden *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 301-320 refs (For availability see N75-31485 22-39)

The effect of localized structural damping on the excitability of higher order normal modes of the large space telescope was investigated. A preprocessor computer program was developed to incorporate Voigt structural joint damping models in a NASTRAN finite-element dynamic model. A postprocessor computer program was developed to select critical modes for low-frequency attitude control problems and for higher frequency fine-stabilization problems. The mode selection is accomplished by ranking the flexible modes based on coefficients for rate gyro, position gyro, and optical sensors, and on image-plane

motions due to sinusoidal or random power spectral density force and torque inputs. Author

N75-31503* Boeing Vertol Co., Philadelphia, Pa.
FINITE ELEMENT ANALYSIS USING NASTRAN APPLIED TO HELICOPTER TRANSMISSION VIBRATION/NOISE REDUCTION
R. W. Howells and J. J. Sciarra *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 321-340 refs (For availability see N75-31485 22-39)
(Contract DAAJ02-74-C-0040)

A finite element NASTRAN model of the complete forward rotor transmission housing for the Boeing Vertol CH-47 helicopter was developed and applied to reduce transmission vibration/noise at its source. In addition to a description of the model, a technique for vibration/noise prediction and reduction is outlined. Also included are the dynamic response as predicted by NASTRAN, test data, the use of strain energy methods to optimize the housing for minimum vibration/noise, and determination of design modifications which will be manufactured and tested. The techniques presented are not restricted to helicopters but are applicable to any power transmission system. The transmission housing model developed can be used further to evaluate static and dynamic stresses, thermal distortions, deflections and load paths, fail-safety/vulnerability, and composite materials. Author

N75-31504* General Dynamics Corp., San Diego, Calif. Convair Div.
ANALYSIS OF NONLINEAR STRUCTURES VIA MODE SYNTHESIS
R. K. Gieseke *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 341-360 refs (For availability see N75-31485 22-39)

An effective procedure for NASTRAN was developed that permits any number of substructures of any size to be synthesized for the purpose of developing normal modes of vibration of the complete structural system. The technique is extended to permit modal transient analysis of the subdivided system. This latter procedure permits the use of NASTRAN's ability to include nonlinear forces in the problem. The five-phase process is accomplished using standard NASTRAN rigid formats with problem-independent alter packages and DMAP sequences. Author

N75-31505* Littleton Research and Engineering Corp., Mass.
APPLICATION OF NASTRAN TO PROPELLER-INDUCED SHIP VIBRATION
Atis A. Liepins and John H. Conaway (Control Data Corp.) *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 361-375 refs (For availability see N75-31485 22-39)

An application of the NASTRAN program to the analysis of propeller-induced ship vibration is presented. The essentials of the model, the computational procedure, and experience are described. Desirable program enhancements are suggested. Author

N75-31506* Naval Underwater Systems Center, New London, Conn.
TRANSIENT ANALYSIS OF BODIES WITH MOVING BOUNDARIES USING NASTRAN
John W. Frye *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 377-388 (For availability see N75-31485 22-39)

A scheme is presented which allows the modeling of a moving boundary with NASTRAN NOLIN cards. Various aspects and limitations of the approach are explained. Recommendations are given as to the procedure to be used in implementing the method. Author

N75-31507* Maryland Univ., College Park.
APPLICATION OF NASTRAN IN NONLINEAR ANALYSIS OF A CARTRIDGE CASE NECK SEPARATION MALFUNCTION
Jackson C. S. Yang and Diana L. Frederick (Frankford Arsenal) *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 389-395 refs (For availability see N75-31485 22-39)

The problem of case neck separation malfunction in the field of ammunition structural analysis is investigated. The axi-symmetric solid of revolution RING element was utilized in the manual piecewise linear analysis to obtain the expansion of the wall of the cartridge case and barrel chamber by the pressure of propellant gases and the stresses in the structure. The analysis included the varying material properties along the wall of the case and the chamber. Additional instructions were provided to change the element material ID's without recomputing the entire stiffness matrix. Author

N75-31508* Hanford Engineering Development Lab., Richland, Wash.
NONLINEAR SEISMIC ANALYSIS OF A REACTOR STRUCTURE IMPACT BETWEEN CORE COMPONENTS
Ronald G. Hill *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 397-418 refs (For availability see N75-31485 22-39)

The seismic analysis of the FFTF-PIOTA (Fast Flux Test Facility-Postirradiation Open Test Assembly), subjected to a horizontal DBE (Design Base Earthquake) is presented. The PIOTA is the first in a set of open test assemblies to be designed for the FFTF. Employing the direct method of transient analysis, the governing differential equations describing the motion of the system are set up directly and are implicitly integrated numerically in time. A simple lumped-nass beam model of the FFTF which includes small clearances between core components is used as a 'driver' for a fine mesh model of the PIOTA. The nonlinear forces due to the impact of the core components and their effect on the PIOTA are computed. Author

N75-31509* Naval Ship Research and Development Center, Bethesda, Md. Computation and Mathematics Dept.
THE DYNAMIC ANALYSIS OF SUBMERGED STRUCTURES
Gordon C. Everstine, Erwin A. Schroeder, and Melvyn S. Marcus *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 419-429 refs (For availability see N75-31485 22-39)

Methods are described by which the dynamic interaction of structures with surrounding fluids can be computed by using finite element techniques. In all cases, the fluid is assumed to behave as an acoustic medium and is initially stationary. Such problems are solved either by explicitly modeling the fluid (using pressure or displacement as the basic fluid unknown) or by using decoupling approximations which take account of the fluid effects without actually modeling the fluid. Author

N75-31510* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE IMPACT OF FOURTH GENERATION COMPUTERS ON NASTRAN
James L. Rogers, Jr. *In its* NASTRAN: Users' Experiences Sep. 1975 p 431-447 refs (For availability see N75-31485 22-39)
CSCL 09B

The impact of 'fourth generation' computers (STAR 100 or ILLIAC 4) on NASTRAN is considered. The desired characteristics of large programs designed for execution on 4G machines are described. Author

N75-31511* Boeing Computer Services, Inc., Seattle, Wash.
NASTRAN PRE AND POSTPROCESSORS USING LOW-COST INTERACTIVE GRAPHICS
E. D. Herness and H. Z. Kriloff *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 449-460 refs (For availability see N75-31485 22-39)

A design for a NASTRAN preprocessor is given to illustrate a typical preprocessor. Several displays of NASTRAN models illustrate the preprocessor's capabilities. A design of a NASTRAN postprocessor is presented along with an example of displays generated by that NASTRAN processor. Author

N75-31512* Control Data Corp., Minneapolis, Minn. CYBERNET Service Div.
SCANNING NASTRAN OUTPUT DATA FOR MAXIMUM AND MINIMUM VALUES
Donald C. Walker *In* NASA. Langley Res. Center NASTRAN:

Users' Experiences Sep. 1975 p 461-474 refs (For availability see N75-31485 22-39)

A computer program called NASCAN (NASTRAN scan) is described. NASCAN enables users to scan lengthy NASTRAN output files for maximum and minimum values in easy user oriented categories. Areas of high stress or deflections in any of the NASTRAN rigid formats are quickly detected and listed out for project documentations. The NASTRAN model is then revised if necessary by updating an input file tape which is processed through the NASTRAN program. Author

N75-31513* Universal Analytics, Inc., Playa Del Rey, Calif.
UNDERSTANDING THE NASTRAN STRUCTURAL PLOTTER
Loren R. Kuusinen *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 475-492 refs (For availability see N75-31485 22-39)

Functions of the plotting hardware and the operations performed by the NASTRAN structural plotter are summarized to provide the user an insight into how the program works. The processing performed in response to each plot command is described and the interrelationships of the various parameters are explained. To assist in the effective and efficient utilization of the system, examples are provided which also illustrate several not yet documented capabilities of the Level 16 structural plotter. Author

N75-31514* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE NASTRAN ERROR CORRECTION INFORMATION SYSTEM (ECIS)
David C. Rosser, Jr. and James L. Rogers, Jr. *In its* NASTRAN: Users' Experiences Sep. 1975 p 493-509 refs (For availability see N75-31485 22-39)
CSCL 05B

A data management procedure, called Error Correction Information System (ECIS), is described. The purpose of this system is to implement the rapid transmittal of error information between the NASTRAN Systems Management Office (NSMO) and the NASTRAN user community. The features of ECIS and its operational status are summarized. The mode of operation for ECIS is compared to the previous error correction procedures. It is shown how the user community can have access to error information much more rapidly when using ECIS. Flow charts and time tables characterize the convenience and time saving features of ECIS. Author

N75-31515* Naval Ship Research and Development Center, Bethesda, Md.
RECENT IMPROVEMENTS TO BANDIT
Gordon C. Everstine *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 511-521 refs (For availability see N75-31485 22-39)

The NASTRAN preprocessor BANDIT, which improves NASTRAN's computer efficiency by resequencing grid point labels for reduced matrix bandwidth is described. The addition of (1) the Gibbs-Poole-Stockmeyer (GPS) algorithm, and (2) the user option to reduce matrix profile rather than matrix bandwidth is also described. It is shown that, compared to the Cuthill-McKee algorithm on which BANDIT was originally based, GPS is faster and achieves similar results. Current capabilities and options of BANDIT are summarized. Author

N75-31516* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NASTRAN THERMAL ANALYZER STATUS, EXPERIENCE, AND NEW DEVELOPMENTS
H. P. Lee *In its* NASTRAN: User's Experiences Sep. 1975 p 523-528 refs (For availability see N75-31485 22-39)
CSCL 20M

The unique finite element based NASTRAN Thermal Analyzer originally developed as a general purpose heat transfer analysis incorporated into the NASTRAN system is described. The current status, experiences from field applications, and new developments are included. Author

N75-31517* Computer Sciences Corp., El Segundo, Calif.
APPLICATION EXPERIENCES OF NASTRAN THERMAL ANALYSIS IN ENGINEERING
James Chi-Dian Go *In* NASA. Langley Res. Center NASTRAN: User's Experiences Sep. 1975 p 529-531 (For availability see N75-31485 22-39)

The application of the thermal analysis phase of NASTRAN in engineering is described. Some illustrative samples are presented to demonstrate the applicability and limitation of NASTRAN thermal analysis capability. The results of the evaluation of the relative efficiency, applicability and accuracy among NASTRAN, other finite element programs, and finite difference programs are also presented. Author

N75-31518* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPARISON OF NASTRAN AND MITAS NONLINEAR THERMAL ANALYSES OF A CONVECTIVELY COOLED STRUCTURE
Earl A. Thornton (Old Dominion Univ.) and Allan R. Wieting *In its* NASTRAN: Users' Experiences Sep. 1975 p 533-555 refs (For availability see N75-31485 22-39)
(Grant NsG-1093)
CSCL 20M

Comparative steady state nonlinear thermal analyses of a scramjet fuel injection strut are presented. The analyses were performed using the NASTRAN finite element program and MITAS, a lumped-parameter thermal analyzer. The strut is subjected to aerodynamic heating on two sides and is internally cooled by hydrogen flowing from internal manifolds through heat exchangers bonded to the primary structure. Based on coolant temperatures determined by MITAS, NASTRAN predicted temperature distributions throughout the strut which were in close agreement with similar MITAS predictions. Author

N75-31519* Reactor Centrum Nederland, The Hague.
RIGID FORMAT ALTER PACKETS FOR THE ANALYSIS OF ELECTROMAGNETIC FIELD PROBLEMS
E. Spreeuw and R. J. B. Reefman (Hazemeyer B. V.) *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 557-570 refs (For availability see N75-31485 22-39)

The computer program NASTRAN is used to solve electromagnetic field problems. The diffusion equation and the boundary conditions valid for problems of these kinds together with a replacing potential energy function are given. The extent to which an analogy with finite element displacement and temperature approaches holds is indicated. The outputting of complex quantities is made possible after adjustment of standard rigid format 1 input data blocks to module SDR2. The applications made involve the study of the proximity effect in a system of three parallel conductors and the analysis of the magnetic field in the vicinity of the points of contact in circuit breakers. Author

N75-31520* Universal Analytics, Inc., Playa Del Rey, Calif.
THE AUTOMATED MULTI-STAGE SUBSTRUCTURING SYSTEM FOR NASTRAN
E. I. Field, D. N. Herting, D. L. Herendeen, and R. L. Hoesly *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 571-591 (For availability see N75-31485 22-39)

The substructuring capability developed for eventual installation in Level 16 is now operational in a test version of NASTRAN. Its features are summarized. These include the user-oriented, Case Control type control language, the automated multi-stage matrix processing, the independent direct access data storage facilities, and the static and normal modes solution capabilities. A complete problem analysis sequence is presented with card-by-card description of the user input. Author

N75-31521* Universal Analytics, Inc., Playa Del Rey, Calif.
AN IMPROVED DMAP CAPABILITY
David L. Herendeen *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 595-602 (For availability see N75-31485 22-39)

A set of improvements designed and implemented into a test version of the NASTRAN DMAP (Direct Matrix Abstraction Program) compiler is presented. These modifications simplify the use of the DMAP control language while enhancing its power and versatility. The implemented changes are described and examples are presented to illustrate their use. Author

N75-31522* Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
DELTA WING FLUTTER BASED ON DOUBLET LATTICE METHOD IN NASTRAN
Howard Jew *In* NASA. Langley Res. Center NASTRAN: Users' Experiences Sep. 1975 p 603-613 refs (For availability see N75-31485 22-39)
(Contract NAS9-12200)
CSCL 01C

The subsonic doublet-lattice method (DLM) aeroelastic analysis in NASTRAN was successfully applied to produce subsonic flutter boundary data in parameter space for a large delta wing configuration. Computed flow velocity and flutter frequency values as functions of air density ratio, flow Mach number, and reduced frequency are tabulated. The relevance and the meaning of the calculated results are discussed. Several input-deck problems encountered and overcome are cited with the hope that they may be helpful to NASTRAN Rigid Format 45 users. Author

N75-31523* General Motors Research Labs., Warren, Mich.
NASTRAN MODELING AND ANALYSIS OF RIGID AND FLEXIBLE WALLED ACOUSTIC CAVITIES
Joseph A. Wolf, Jr. and Donald J. Nefske *In* NASA. Langley Res. Center NASTRAN: User's Experiences Sep. 1975 p 615-631 refs (For availability see N75-31485 22-39)

The acoustic slot elements, CSLOTi, are applied to analyze two-dimensional enclosures with fixed or moving boundaries. The capability utilized to compute (a) the acoustic natural modes and frequencies of a rigid walled enclosure and (b) the sound pressure at any point inside an enclosure when the surrounding walls are forced to vibrate. Applications to an automobile passenger compartment illustrate the technique. The axisymmetric fluid elements, CFLUIDi, are used in conjunction with a suitable choice of symmetry planes and a model of the surrounding structure to approximate a two-dimensional enclosure with flexible walls. The enclosure walls are modeled using finite elements or structural modes. Illustrative examples include a comparison of rectangular cavity modes with those calculated using the acoustic slot element and the free vibration modes of two enclosures coupled through a flexible rectangular panel. Author

N75-31524# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
EXPERIMENTS ON LARGE PLASTIC DEFORMATIONS OF CIRCULAR PLATES WITH WORK HARDENING
R. Winter and H. S. Levine Jul. 1975 89 p refs
(RE-502) Avail: NTIS HC $4.75

Tests were performed on three simply supported circular plates of aluminum alloy, under a central concentrated load, with large deflection. Measurements were made of load, deflections, and strains, and membrane and bending strains were calculated from the test data. The test data are presented in comparison with theoretical predictions generated by the finite element computer code PLANS. The correlation between theory and test data was excellent for deflections, and generally good for strains, using the circular line load predictions. The greatest deviation between predicted and measured strains was in the region of the concentrated load. The plates exhibited initial loss of stiffness under the plastic bending behavior, followed by a rapidly increasing membrane action resulting from large deflections, which provided much additional resistance to the applied load. Author

N75-31525*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A MONTE CARLO ANALYSIS OF THE VIKING LANDER DYNAMICS AT TOUCHDOWN
Ralph J. Muraca, Janet W. Campbell, and C. Anderson King (LTV Aerospace Corp., Hampton, Va.) Washington Sep. 1975 56 p refs
(NASA-TN-D-7959; L-9830) Avail: NTIS HC $4.25 CSCL 22C

The performance of the Viking lander has been evaluated by using a Monte Carlo simulation, and all results are presented in statistical form. The primary objectives of this analysis were as follows: (1) to determine the three sigma design values of maximum rigid body accelerations and the minimum clearance of the lander body during landing; (2) to determine the probability of an unstable landing; and (3) to determine the probability of the lander body striking a rock. Two configurations were analyzed with the only difference being in the ability of the primary landing gear struts to carry tension loads. Author

N75-31526*# Ohio State Univ., Columbus. Aero-Astro Engineering Dept.
VIBRATION OF SKEWED CANTILEVER PLATES AND HELICOIDAL SHELLS
D. P. Beres and C. D. Bailey Washington NASA Sep. 1975 79 p refs
(Grant NGR-36-008-197)
(NASA-CR-2588) Avail: NTIS HC $4.75 CSCL 20K

Theoretical vibration frequencies and mode shapes are obtained for skewed plates and helicoidal shells with a cantilever boundary. Using Hamilton's law of varying action, a power series solution is developed to obtain converged numerical results for the five lowest frequencies. Effects of geometrical variables such as aspect ratio, sweep angle and shell radius to thickness ratio are investigated. Accuracy of the solution method is substantiated by comparison with existing skewed plate spherical cap, and conical shell results. Author

N75-31527*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A FINITE-DIFFERENCE PROGRAM FOR STRESSES IN ANISOTROPIC, LAYERED PLATES IN BENDING
Nicholas J. Salamon Washington Sep. 1975 85 p refs
(NASA-TN-D-8059) Avail: NTIS HC $4.75 CSCL 20K

The interlaminar stresses induced in a layered laminate that is bent into a cylindrical surface are studied. The laminate is modeled as a continuum, and the resulting elasticity equations are solved using the finite difference method. The report sets forth the mathematical framework, presents some preliminary results, and provides a listing and explanation of the computer program. Significant among the results are apparent symmetry relationships that will reduce the numerical size of certain problems and an interlaminar stress behavior having a sharp rise at the free edges. Author

N75-31528# Lockheed Missiles and Space Co., Palo Alto, Calif.
BEHAVIOR OF A CYLINDRICAL SANDWICH SHELL CONNECTED WITH RIGID MASSES SUBJECTED TO AN ACOUSTIC PRESSURE WAVE
E. I. Grigoliuk and E. B. Kuznetsov 1975 8 p refs Transl. into ENGLISH from Prikl. Mekh. Tekhn. Fiz. (USSR), no. 2, 1975 p 183-188
Avail: NTIS HC $3.25; National Translation Center, John Crerar Library, Chicago, Ill. 60616

The investigation of the behavior of a cylindrical sandwich shell is based on the nonlinear equilibrium equations of nonshallow sandwich shells of nonsymmetric structure. Inertial forces in the radial and tangential directions, as well as the rotational inertia of the core were taken into account in obtaining the equations of motion. Author

N75-31529*# Southwest Research Inst., San Antonio, Tex.
PREDICTION OF PAYLOAD VIBRATION ENVIRONMENTS BY MECHANICAL ADMITTANCE TEST TECHNIQUES Final Report
Daniel D. Kana and Luis M. Vargas Washington NASA Sep. 1975 40 p refs
(Contract NAS1-12402)
(NASA-CR-2591; Rept-02-3689) Avail: NTIS HC $3.75 CSCL 22B

A series of experiments was conducted with simple beam and mass launch vehicle and payload models in order to determine the validity of mechanical admittance/impedance techniques applied to development of improved payload vibration tests. Admittances and impedances were measured from tests of the individual components to form matrices which were combined analytically to allow prediction of responses for the complete system. Results were computed for a transmission matrix approach and an admittance matrix approach. Both a rigid body and a flexible payload model were considered. The results clearly demonstrate that the transmission matrix method is too sensitive to measurement error to be practical for this application, while

the pure admittance matrix method produces quite satisfactory results. The effects of various errors on the final results are demonstrated. Author

N75-31530# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

CONSTRUCTION AND CALCULATION USING FINITE ELEMENTS [KONSTRUKTION UND BERECHNUNG MIT FINITEN ELEMENTEN]

John H. Argyris and Ingolf Grieger 1973 49 p refs In GERMAN Sponsored by Bundesmin. fuer Forsch. und Technol. (ISD-148) Avail: NTIS HC $3.75

The finite element method was applied to computer assisted construction procedures. The advantages of this method when several partial problems need to be investigated are pointed out. The various calculations can be carried out with relatively little effort by a unified idealization. The discretization of a structure in finite elements is a method appropriate to computer implementation and especially to interactive computer graphics. The latter is illustrated for a rail vehicle wheel structure. ESRO

N75-31531# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

INVESTIGATION AND FURTHER DEVELOPMENT OF SOME METHODS FOR OPTIMAL DIMENSIONING OF SUPPORT STRUCTURES [UNTERSUCHUNG UND WEITERENTWICKLUNG EINIGER VERFAHREN ZUR OPTIMALEN DIMENSIONIERUNG VON TRAGWERKEN]

H.-P. Mlejnek, J. Buehlmeier, and M. M. Mai Jul. 1974 99 p refs In GERMAN

(Contract RV-I-1-TC-3/72-B)

(ISD-159) Avail: NTIS HC $4.75

Three methods for the optimization of spacecraft structures were investigated: energy method, gradient method, and hyperdistance method. It is shown that the energy method does not operate reliably in each case, that convergence difficulties can be maintained, and that this method provides an economic preliminary step in the optimization process. The further development of the gradient method was aimed at an improvement of economics. The hyperdistance method was used to avoid the stress gradient calculation and also to economize on the one-step linear optimization; it gave no convergence problems. The simplification also led to a premature interruption of the iteration before reaching optimum. The combination of energy method and improved gradient method seems to provide an economic and reliable means of optimization. ESRO

N75-31532# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Construction Metallique.

REINFORCEMENT METHOD OF OPENINGS IN CYLINDRICAL PRESSURE VESSELS SUBJECT TO INTERNAL PRESSURE

Joris Decock Feb. 1975 43 p refs Sponsored by Inst. pour l'Encour. de la Rech. Sci. dans l'Ind. et l'Agr.

(CRIF-MT-104) Avail: NTIS HC $3.75

Different methods for calculating the stress concentration factors at the crotch corner of an opening are presented, as well as their accuracy. A comparison was made with experimental results from 156 different stress measurements. Different design codes are discussed together with the design bases. The criteria which must be taken into account for developing a design method are also examined. Only the shakedown concept was retained, and according to this criterion, all points of the pressure vessel must show an elastic behavior after at least five pressurizing cycles. At the crotch corner of an opening, the elastic behavior is assured if a maximum stress intensification of 2.25 times the allowable stress is accepted, and based on that value, design curves were drawn. By these curves the efficiency of the reinforcement can be calculated as a function of the dimensions. Author (ESRO)

N75-31533# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

A COMPUTER PROGRAMME FOR ELASTIC-PLASTIC CALCULATIONS WITH USE OF TRIM 6 FINITE ELEMENTS

A. U. DeKoning and A. Sanderse 10 Dec. 1972 40 p refs Sponsored by Neth. Agency for Aerospace Programs

(NLR-TR-72144-U) Avail: NTIS HC $3.75

A computer program for computation of elastic-plastic deformation in plane stress is described. Linear strain triangular elements (TRIM6) are used in conjunction with a plasticity model which accounts for both initial and strain hardening material anisotropy with regard to plastic deformation. Author (ESRO)

N75-31534# European Space Research Organization, Paris (France).

GENERAL DIFFERENTIAL EQUATIONS IN MATRIX FORM FOR THIN ELASTIC SHELLS WITH A SOLUTION FOR TWISTED TUBES

W. Woebbecke Mar. 1975 108 p refs Transl. into ENGLISH of "Allgemeine Differentialgleichungen duenner elastischer Schalen in Matrizendarstellung mit einer Loesung fuer verwundene Roehren", DFVLR, Brunswick Report DLR-FB-73-118, Oct. 1973 Original German report available from DFVLR, Porz, West Ger. 23.50 DM

(ESRO-TT-142; DLR-FB-73-118) Avail: NTIS HC $5.25

Canonical differential equations in matrix form are presented for a bending theory of thin elastic shells. From these a set of eight equations is obtained containing as unknowns the three components of the displacement vector, one component of the rotation vector, and the corresponding four generalized forces. With respect to one of the coordinates of the middle surface, only first-order partial derivatives of the unknowns occur. This formulation of the shell equations is particularly convenient if the dependence of the variables on the other coordinate of the middle surface can be expressed as a series. The equations are applied to calculate the deformations and stresses for twisted tubes. Author (ESRO)

N75-31535# Atomic Energy Research Establishment, Harwell (England). Non-Destructive Testing Centre.

THE ROLE OF TRANSIENT SPECTRUM AND DAMPING ANALYSIS IN ASSESSING THE STRENGTH OF POLYMERIC ADHESIVE METAL BONDING Final Scientific Report, 1 Jul. - 30 Jun. 1974

G. J. Curtis, A. B. Joinson, and P. A. Lloyd Jan. 1975 190 p refs

(Grant AF-AFOSR-2523-73; AF Proj. 7351)

(AD-A009172; AFML-TR-74-280) Avail: NTIS CSCL 11/1

This report describes the derivation of an acoustic impact testing facility and some results that have been obtained using it. The primary task has been to examine what acoustic phenomena associated with the response to impact of an adhesively bonded joint relate to the strength of the joint. A first look system employing a 40 microsec. contact time impactor, a broadband polymeric foil transducer and a PDP8/I on-line computer has been used to identify the parameters of interest and the most efficient analysis scheme. This system accesses data at rates up to 4MHz with a data block size of 256, 10 bit words thus specifying the frequency interval between points in the computed frequency spectrum as (sampling frequency/256). The analysis has centered around the computation of the fast Fourier transform of the impact response to obtain frequency response spectra and damping information. Initial results using the first look system have shown that the presence of artificial defects in rectangular bars can be detected. For adhesively bonded joints, results suggest that damping analysis may be useful in assessing glue line porosity, whereas modal frequency shift is sensitive to cohesive strength. GRA

N75-31536# Army Materiel Command, Texarkana, Tex. Intern Training Center.

AN EVALUATION OF THE GC OPTRONICS HOLOGRAPHIC INTERFEROMETER USED FOR TESTING HONEYCOMB SANDWICH MATERIALS Final Report

Douglas Neal Warrington Apr. 1975 115 p refs

(AD-A009277; USAMC-ITC-02-08-75-005) Avail: NTIS CSCL 11/4

This research is intended to evaluate a new-generation holographic interferometer built by GC Optronics as commissioned for the Army by Natick Laboratories. The device was designed to be used for detecting subsurface defects in aluminum-skinned paper-honeycomb sandwich material used by the Armed Forces in the construction of portable shelters. GRA

N75-31537# Technion - Israel Inst. of Tech., Haifa. Material Mechanics Lab.
FINITE ELEMENT ANALYSIS FOR THE TIME-DEPENDENT INELASTIC MATERIAL BEHAVIOR Interim Report, 1974 - 1975
M. Newman, Z. Zaphir, and S. R. Bodner Feb. 1975 29 p refs
(Grant AF-AFOSR-2607-74; AF Proj. 9782)
(AD-A009164; SR-5; AFOSR-75-0608TR; MED-47) Avail: NTIS CSCL 11/6

A representation of inelastic, time-dependent material behavior, due to Bodner and Partom, in which both elastic and inelastic deformations are considered to be present at all stages of loading and unloading, is shown to be well-suited to structural analyses using finite element modeling techniques and high speed digital computation methods. The formulation considerably simplifies the computational logic for non-monotonic and cyclic loading problems since no special unloading criteria or yield conditions are required. Examples demonstrating strain-rate sensitivity, work-hardening, and reversed loading behavior are given for problems in the small strain range. GRA

N75-31538# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
ANALYTICAL AND NUMERICAL STUDY OF THE EFFECTS OF INITIAL IMPERFECTIONS ON THE INELASTIC BUCKLING OF A CRUCIFORM COLUMN Interim Report
J. W. Hutchinson and B. Budiansky Dec. 1974 16 p refs
(Grant AF-AFOSR-2476-73; AF Proj. 9782)
(AD-A009162; DEAP-S-11; AFOSR-75-0605TR) Avail: NTIS CSCL 20/1

The inelastic buckling of a cruciform column is investigated by a combination of analytical and numerical methods. An exact asymptotic analysis for the effect of small imperfections on the maximum load reveals clearly how it is possible for an exceedingly small imperfection to have a very large influence. As long as the strain hardening is sufficiently low, the numerical analysis confirms that Onat-Drucker conclusion that unavoidably small imperfections, together with the use of J2 flow theory, give rise to a maximum load prediction which is approximated by the bifurcation load prediction based on a deformation theory of plasticity. GRA

N75-31539# Iowa Univ., Iowa City. Div. of Materials Engineering.
PARAMETRIC OPTIMAL DESIGN. PART 1. FIRST ORDER ALGORITHM Final Report, May - Dec. 1974
Byung Man Kwak, Kwan Rim, and J. S. Arora Mar. 1975 93 p refs
(Contract DAAA09-74-M-2014)
(AD-A009579; AC-CR-75-001-Pt-1; TR-13) Avail: NTIS CSCL 20/11

In this report, a new formulation, called parametric optimal design, has been introduced. The generality of the problem formulation is shown in relation to several classes of classical optimization problems. A first order algorithm has been developed. Test problems from various fields such as finite allocation problem, vibration isolator design, dynamical system design and structural design problem, have been solved, showing practicability of the algorithm developed here. GRA

N75-31540# Iowa Univ., Iowa City. Div. of Materials Engineering.
PARAMETRIC OPTIMAL DESIGN. PART 2. SECOND ORDER ALGORITHM AND HYBRID METHOD Final Report, May - Dec. 1974
Byung Man Kwak, Kwan Rim, and J. S. Arora Mar. 1975 89 p refs
(Contract DAAA09-74-M-2015)
(AD-A009580; AC-CR-75-002-Pt-2; TR-14) Avail: NTIS CSCL 20/11

In this report, a second order algorithm and a hybrid second and first order method are developed using sensitivity analysis with error compensation. Test problems are solved and compared with the results obtained by first order method. Also presented is the implementation of the developed algorithms for computer calculations. GRA

N75-31541# Iowa Univ., Iowa City. Div. of Materials Engineering.
OPTIMAL DESIGN OF CONTINUOUS STRUCTURAL SYSTEMS Technical Report, May - Nov. 1974
K. Matsui Mar. 1975 33 p refs
(Contract DAAA09-74-M-2022)
(AD-A009582; AC-CR-75-004; TR-15) Avail: NTIS CSCL 20/11

In this report, optimal design of continuous structural systems is considered. A generalized steepest descent method based on optimal control techniques is developed. The method is applied to simply supported beam and plate problems. Constraints considered for these problems are bounds on displacement, natural frequency and design variables. Results for simultaneous imposition of various constraints are new. GRA

N75-31542# California Univ., Berkeley. Earthquake Engineering Research Center.
MODELING AND IDENTIFICATION IN NONLINEAR STRUCTURAL DYNAMICS. 1: ONE DEGREE OF FREEDOM MODELS
Nestor Distefano and Amitav Rath Dec. 1974 106 p refs
(Grant NSF GI-36387)
(PB-241548/7; EERC-74-15) Avail: NTIS HC $5.25 CSCL 13M

The present research deals with the development of reliable and efficient identification methods for the optimal determination of the model parameters associated with nonlinear characteristics of structural systems undergoing seismic effects. GRA

N75-31543# Army Construction Engineering Research Lab., Champaign, Ill.
ESTIMATING THE LIFE EXPECTANCY OF FACILITIES Final Report
Jeffrey G. Kirby and John M. Grgas Apr. 1974 53 p refs
(AD-A009522; CERL-TR-P-36) Avail: NTIS CSCL 13/13

This technical report presents a model which predicts the expected remaining life of a building. Procedures for use of the model are described. GRA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N75-31544*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 1: EARTH RESOURCES PROGRAM SCOPE AND INFORMATION NEEDS
Nov. 1974 443 p
(Contract NAS9-13401)
(NASA-CR-141767) Avail: NTIS HC $11.25 CSCL 05B

The form of the Total Earth Resources System in the Shuttle Era (TERSSE), a complex system of data gathering, translation, distribution, and utilization functions, is investigated. Methods for analyzing potential user requirements developed and used to form a broad base of user information requirements for system design are described. It is indicated that TERSSE is comprised of a research and development segment and an operational segment, each interfacing with two major communities of operational users: resource managers and scientists. The scope and interfaces of each segment are defined along with earth

resources information requirements, resource management activities of potential user organizations, and information requirements of the user organizations. J.M.S.

N75-31545*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 2: AN ASSESSMENT OF THE CURRENT STATE-OF-THE-ART
Oct. 1974 239 p
(Contract NAS9-13401)
(NASA-CR-141768) Avail: NTIS HC $7.50 CSCL 05B

Results of a state-of-the-art assessment of technology areas which affect the Earth Resources Program are presented along with a functional description of the basic earth resources system. Major areas discussed include: spacecraft flight hardware, remote sensors, data processing techniques and hardware, user models, user interfaces, and operations technology. J.M.S.

N75-31546*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 3: MISSION AND SYSTEM REQUIREMENTS FOR THE TOTAL EARTH RESOURCES SYSTEM
Nov. 1974 258 p
(Contract NAS9-13401)
(NASA-CR-141769) Avail: NTIS HC $8.50 CSCL 05B

Resource management missions to be performed by TERSSE are described. Mission and user requirements are defined along with information flows developed for each major resource management mission. Other topics discussed include: remote sensing platforms, remote sensor requirements, ground system architecture, and such related issues as cloud cover, resolution, orbit mechanics, and aircraft versus satellite. J.M.S.

N75-31547*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 4: THE ROLE OF THE SHUTTLE IN THE EARTH RESOURCES PROGRAM
Nov. 1974 134 p
(Contract NAS9-13401)
(NASA-CR-141770) Avail: NTIS HC $5.75 CSCL 05B

The potential of the space shuttle as a platform for captive earth resources payloads in the sortie mode, and as a launch and services vehicle for automated earth resources spacecraft is examined. The capabilities of the total space transportation system which are pertinent to earth resources sorties and automated spacecraft are included. J.M.S.

N75-31548*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 5: DETAILED SYSTEM REQUIREMENTS: TWO CASE STUDIES
Nov. 1974 310 p refs
(Contract NAS9-13401)
(NASA-CR-141771) Avail: NTIS HC $9.25 CSCL 05B

Major resource management missions to be performed by the TERSSE are examined in order to develop an understanding of the form and function of a system designed to perform an operational mission. Factors discussed include: resource manager (user) functions, methods of performing their function, the information flows and information requirements embodied in their function, and the characteristics of the observation system which assists in the management of the resource involved. The missions selected for study are: world crop survey and land resources management. These missions are found to represent opposite ends of the TERSSE spectrum and to support the conclusion that different missions require different systems and must be analyzed in detail to permit proper system development decisions. Author

N75-31549*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 6: AN EARLY SHUTTLE PALLET CONCEPT FOR THE EARTH RESOURCES PROGRAM
Nov. 1974 70 p
(Contract NAS9-13401)
(NASA-CR-141772) Avail: NTIS HC $4.25 CSCL 05B

A space shuttle sortie mission which can be performed inexpensively in the early shuttle era and which, if the necessary intermediate steps are accomplished provides a major technological advance for the user organization-the U.S. Bureau of Census is described. The orbital configuration created for the Urban Land Use/1980 Census mission is illustrated including sensors and ground support equipment along with the information flow for the mission. Factors discussed include: specific Census Bureau functions to be supported by the mission; hardware and flight operations necessary for implementation of the mission; and integration of the TERSSE pallet into a shuttle mission. J.M.S.

N75-31550*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 7: USER MODELS: A SYSTEM ASSESSMENT
Oct. 1974 91 p
(Contract NAS9-13401)
(NASA-CR-141773) Avail: NTIS HC $4.75 CSCL 05B

User models defined as any explicit process or procedure used to transform information extracted from remotely sensed data into a form useful as a resource management information input are discussed. The role of the user models as information, technological, and operations interfaces between the TERSSE and the resource managers is emphasized. It is recommended that guidelines and management strategies be developed for a systems approach to user model development. J.M.S.

N75-31551*# General Electric Co., Philadelphia, Pa. Space Div.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA. VOLUME 8: USER'S MISSION AND SYSTEM REQUIREMENTS DATA (APPENDIX A OF VOLUME 3)
Oct. 1974 303 p
(Contract NAS9-13401)
(NASA-CR-141774) Avail: NTIS HC $9.25 CSCL 05B

A computer printout is presented of the mission requirement for the TERSSE missions and their associated user tasks. The data included in the data base represents a broad-based attempt to define the amount, extent, and type of information needed for an earth resources management program in the era of the space shuttle. An effort was made to consider all aspects of remote sensing and resource management; because of its broad scope, it is not intended that the data be used without verification for in-depth studies of particular missions and/or users. The data base represents the quantitative structure necessary to define the TERSSE architecture and requirements, and to an overall integrated view of the earth resources technology requirements of the 1980's. Author

N75-31552*# General Electric Co., Philadelphia, Pa. Advanced NASA Program Office.
TERSSE: DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA: EXECUTIVE SUMMARY
Mar. 1975 29 p Prepared in cooperation with Environ. Res. Inst. of Mich., Ann Arbor, Mich.
(Contract NAS9-13401)
(NASA-CR-141766) Avail: NTIS HC $3.75 CSCL 05B

Results are presented of an investigation of the form of the future system for the Earth Resources Program. System performance requirements for the total operational and research earth resources system in 1980's are defined along with critical research and technology development needs. The role of the space shuttle in the total system is emphasized. Conclusions are summarized. J.M.S.

N75-31553*# Arizona Univ., Tucson. Office of Arid Lands Studies.
APPLIED REMOTE SENSING PROGRAM (ARSP) TO STATE

AND LOCAL GOVERNMENT Annual Report
Jack D. Johnson, Kennith E. Foster, David A. Mouat, and Robin Clark Aug. 1975 66 p refs
(Grant NGL-03-002-313)
(NASA-CR-143456; OALS-Bull-10) Avail: NTIS HC $4.25 CSCL 08B

Environmental surveys of arid land areas (Arizona) in the United States are presented. Maps of soils, vegetation, drainage patterns, and land use are shown. The distribution of uranium deposits, oil and gas pools, is also shown. Legislation pertaining to the preservation of natural resources is discussed. J.R.T.

N75-31554*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
RESEARCH IN REMOTE SENSING OF AGRICULTURE, EARTH RESOURCES, AND MAN'S ENVIRONMENT Final Report
D. A. Landgrebe 1975 166 p refs
(Contract NAS9-14016)
(NASA-CR-144426) Avail: NTIS HC $6.25 CSCL 02C

Progress is reported for several projects involving the utilization of LANDSAT remote sensing capabilities. Areas under study include crop inventory, crop identification, crop yield prediction, forest resources evaluation, land resources evaluation and soil classification. Numerical methods for image processing are discussed, particularly those for image enhancement and analysis. D.M.L.

N75-31555# Committee on Interior and Insular Affairs (U. S. House).
CIRCUM-PACIFIC ENERGY AND MINERAL RESOURCES CONFERENCE
Washington GPO 1974 115 p refs Hearings before Subcomm. on Mines and Mining of Comm. on Interior and Insular Affairs, 93d Congr., 2d Sess., held in Honolulu, Hawaii, 27 and 29 Aug. 1974
(GPO-41-023) Avail: Subcomm. on Mines and Mining

Geothermal and mineral resources in the Pacific Ocean area are investigated. Utilization of geothermal energy for space heating and electric power generation is discussed. Examples of existing systems, potential for further development, and associated environmental effects are examined. In addition, data are presented concerning the distribution on the Pacific Ocean floor of manganese nodules which are enriched with iron, nickel, cobalt and copper. Possibilities for mining the nodules are considered. D.M.L.

N75-31556# Committee on Commerce (U. S. Senate).
OIL AND GAS DEVELOPMENT AND COASTAL ZONE MANAGEMENT
Washington GPO 1974 454 p refs Hearings before Natl. Ocean Policy Study of Comm. on Commerce, 93d Congr., 2d Sess., 23-25 Apr., 2 May and 22 May 1974
(GPO-37-347) Avail: Comm. on Commerce

Oil and gas extraction on the outer continental shelf is discussed along with the environmental, economic and social impact upon the coastal zone. Topics discussed include land and natural resources, oil drilling and exploration, nuclear power plants, and oil leasing. M.J.S.

N75-31557*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
GEOS-C GROUND TRUTH PROGRAM DESCRIPTION DOCUMENT
L. R. Goodman Mar. 1975 196 p refs
(NASA-TM-X-69359) Avail: NTIS HC $7.00 CSCL 08B

Models and plans for in situ measurements required to calibrate and evaluate the altitude and sea state measurement capabilities of the GEOS-C radar altimeter are presented. Author

N75-31558*# Scientific Translation Service, Santa Barbara, Calif.
INVESTIGATION OF EARTH RESOURCES BY SPACE MEANS. PART 1. METHODS OF MEASUREMENT AND PROCESSING OF INFORMATION
Yu. K. Khodarev, ed. and Ya. L. Ziman ed. Washington NASA Sep. 1975 174 p Transl. into ENGLISH from Acad. of Sci. (Moscow), 1975 164 p
(Contract NASw-2791)
(NASA-TT-F-16484) Avail: NTIS HC $6.25 CSCL 05B

Techniques of remote recording of the earth, areas for surveillance, and the construction of flying laboratories on aircraft for carrying out experiments have been investigated, as well as the processing of data resulting from these observations. The utilization of this data was also discussed. Reports were presented concerning how such information could be beneficial in solving economic problems through more efficient use of the earth's natural resources. Author

N75-31559# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
LOW-FREQUENCY MAGNETOTELLURIC SURVEY OF NEW ENGLAND Technical Report, 1974 - 1975
Paul William Kasameyer and Theodore R. Madden Sep. 1974 208 p refs
(Contract N00014-67-A-0204-0045; NR Proj. 371-401)
(AD-A009229) Avail: NTIS CSCL 08/7

Magnetotelluric data from an 11 station array in Vermont, New Hampshire and Massachusetts are presented. A statistical method is developed to estimate apparent resistivity tensor values when the magnetic fields are highly correlated. Observations of electric fields parellel to the structural trends N to NE result in apparent resistivity values comparable to those produced by assuming the Cantwell-McDonald conductivity distribution in the mantle, and different crustal conductivities at different locations. Upper mantle conductivities for the preferred models agree with measurements in other continental areas. Because heat flow is well known in New England, an upper limit may be put on the temperatures in the upper mantle, and the accuracy of using conductivity measurements on olivine as a thermometer for the mantle may be tested. The upper mantle is not warm enough to produce the observed conductivity with very pure olivine. GRA

N75-31560# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
DOPPLER TRANSLOCATION TEST PROGRAM Final Report, Oct. 1972 - Sep. 1973
Frederick M. Gloeckler, Jr., Richard R. Muniz, and Glenn W. Schmeidel Dec. 1974 111 p refs
(Contract DAAK02-71-C-0334; DA Proj. 4A6-63712-D-855)
(AD-A009772; ETL-ETR-74-5) Avail: NTIS CSCL 08/2

The report covers a program of test and evaluation of the AN/PRN-6 (XN-1) Doppler Backpack equipment for use in artillery surveying and, possibly, engineering survey work. Doppler data were obtained by the U.S. Army, U.S. Navy, and the U.S. Coast Guard simultaneously to determine the effectiveness of the various parameters in various modes of operation. The Doppler equipment uses the Navy Navigation Satellite System's radio transmissions of the satellite ephemeris along with the Doppler-shift in carrier frequency to determine the geographical coordinates of the Doppler receiving equipment with the aid of a computer. The Backpack equipment, in particular, is designed for the translocation mode where two or more Backpacks receive simultaneously from a satellite, thereby enabling the determination of the one Backpack position with respect to the other. It was concluded from the test that significant improvement in accuracy could be achieved by incorporating time recovery error correction even without ionospheric refraction correction for distances up to 100 km. It was further concluded that an accuracy of 5 meters rms or better is possible with time recovery correction along with 3-dimensional computational software using 2 to 3 satellite passes. GRA

N75-31561# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
A GUIDE TO METHODS AND STANDARDS FOR THE MEASUREMENT OF WATER FLOW Final Report
Gershon Kulin and Philip R. Compton May 1975 100 p refs
(COM-75-10683/1; NBS-SP-421; LC-75-11527) Avail: NTIS MF $2.25; SOD HC as C13.10:421 CSCL 13B

Selected information sources on methods and standards for making measurements of water and wastewater flow in the field are listed and described. Both closed conduit and free surface flows are treated, but emphasis is on open channel flow measurements needed in water resource engineering and in water

pollution control. Instruments and methods covered include weirs, flumes, current meters (and velocity traverse methods), dilution techniques, pipe flow instruments, acoustic meters, and others. In addition to summarizing the basic properties of each instrument or method and referring users to the best available sources of detailed information on performance and field application, potential sources of error are described and quantified where possible. GRA

N75-31562# Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.
THE OCS (OUTER CONTINENTAL SHELF) PETROLEUM PIE Final Report
J. W. Devanney 28 Feb. 1975 132 p refs
(Grant NOAA-NG-43-72)
(COM-75-10599/9; MITSG-75-10; NOAA-75041105) Avail: NTIS HC $5.75 CSCL 08I

This report analyzes a range of alternatives for managing Outer Continental Shelf (OCS) petroleum from the point of view of national income, public income, and developer income. The economic value of the resource is reviewed, and estimates of unit resource costs obtained for a range of find sizes, water depths and design wave heights. The basic result is that the economic rent associated with yet-to-be-discovered OCS petroleum could easily be in the hundreds of billions of dollars. Management alternatives examined include work obligation permitting, bonus bidding, royalty bidding, profits bidding, and public exploratory drilling followed by bonus bidding. Special emphasis is given the latter option and the ramifications and problems of this system examined in some detail. GRA

N75-31563# Hydrocarbon Research, Inc., Trenton, N.J.
DEMETALLIZATION OF HEAVY RESIDUAL OILS, PHASE 2 Report, Jan. - Dec. 1974
M. C. Chervenak, P. Maruhhnic, and G. Nongbri Feb. 1975 80 p
(Contract EPA-68-02-0293)
(PB-241901/8; EPA-650/2-73-041-a) Avail: NTIS HC $4.75 CSCL 07A

Results are given of a study of demetallization of heavy residual oils. Results of an experimental laboratory investigation to find a new low-cost demetallization catalyst for high metals, high sulfur residual oils were utilized to test the effectiveness of a demetallization catalyst when prepared on a commercial scale. The commercial production catalyst was tested for activity and aging characteristics and compared to laboratory prepared catalysts. The catalyst, test units, and operating conditions and procedures are described. GRA

N75-31564# IBM Watson Research Center, Yorktown Heights, N.Y.
A PHYSICS BASED APPROACH TO HYDROLOGIC RESPONSE MODELING. PHASE 2: APPLICATIONS
R. Allan Freeze Jun. 1973 17 p refs
(Contract DI-14-31-0001-9016)
(PB-241804/4; W73-13854; OWRT-C-4072(9016)(1)) Avail: NTIS HC $3.25 CSCL 08H

A mathematical model of subsurface flow was used to complement a field study of snowmelt runoff in a small upstream source area in the Reynolds Creek Experimental Watershed near Boise, Idaho. Field measurements from an instrumented cross section show that the mechanism of streamflow generation is subsurface delivery of melt-water over limited distances through shallow, high-permeability, low-porosity formations of altered and fractured basalt. The mathematical model provides a two-dimensional, transient, saturated-unsaturated analysis of the subsurface flow at the field site. It proved to be a valuable aid to a unified interpretation of the field measurements. GRA

N75-31565# Geological Survey, Reston, Va.
EAST AFRICA SEMINAR AND WORKSHOP ON REMOTE SENSING OF NATIONAL RESOURCES AND ENVIRONMENT Final Report
Morris Deutsch 3 Apr. 1974 200 p Conference held at Nairobi, Kenya, 21 Mar. - 3 Apr. 1974
(PB-241485/2; IR-NC-41) Avail: NTIS HC $7.00 CSCL 08F

This report covers the East Africa seminar and workshop on remote sensing of natural resources and the environment held in Nairobi, Kenya, March 21 - April 3, 1974, attended by participants from 10 English-speaking African nations. Appendices are included for seminar proceedings, workshop lectures and outlines, field trip reports and critiques by participants, and reports on potential applications of an operational earth resources satellite for the participating countries. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-31566# Select Committee on Small Business (U. S. House).
ENERGY DATA REQUIREMENTS OF THE FEDERAL GOVERNMENT. PART 4: PROPANE AND CRUDE OIL; CONFLICTS OF INTEREST
Washington GPO 1974 507 p refs Hearings before Subcomm. on Activities of Regulatory Agencies of Permanent Select Comm. on Small Business, 93d Congr., 2d Sess., 24-26 Sep.; 2-3 Oct. 1974
(GPO-41-639) Avail: Subcomm. on Activities of Regulatory Agencies

Energy data on which Federal government energy policy in the propane and crude oil allocation program is based are examined. Factors discussed include: lack of data and economic analysis and the existence of a potential conflict of interest. Economic justifications underlying the propane and crude oil allocation regulations are examined. It is recommended that all conflicts of interest be investigated and that the existing conflict of interest statutes be vigorously enforced. J.M.S.

N75-31567# Committee on Science and Astronautics (U. S. House).
SOLAR ENERGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION ACT OF 1974
Washington GPO 1974 384 p refs Hearings on H.R. 15612 before Subcomm. on Energy of Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., No. 42, 30 Jul. and 2 Aug. 1974
(GPO-39-827) Avail: Subcomm. on Energy

Hearings were held before the Subcommittee on Energy of the Committee on Science and Astronautics of the U.S. House of Representatives on July 30 and August 2, 1974 to discuss H.R. 15612, a bill on solar energy research, development, and demonstration. The objective of this bill is to further the conduct of research, development, and demonstrations in solar energy technologies, to establish a solar energy coordination and management project, to amend the National Science Foundation Act of 1950 and the National Aeronautics and Space Act of 1958, to provide for scientific and technical training in solar energy, to establish a Solar Energy Research Institute, to provide for the development of suitable incentives to assure the rapid commercial utilization of solar energy, and for other purposes. Author

N75-31568*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOLAR COLLECTOR PERFORMANCE EVALUATION WITH THE NASA-LEWIS SOLAR SIMULATOR-RESULTS FOR AN ALL-GLASS-EVACUATED-TUBLAR SELECTIVELY-COATED COLLECTOR WITH A DIFFUSE REFLECTOR
Frederick Simon Apr. 1975 30 p refs
(NASA-TM-X-71695; E-8289) Avail: NTIS HC $3.75 CSCL 10A

A solar collector was tested in a solar simulator for inlet temperatures of temperatures of 70 to 200 F, flux levels of 230 and rate of 7 lb/(hr)(sq. ft), and incident angles of 0 deg, 33 deg, and 52 deg. Test results plotted in a form suggested by analysis indicate a very low heat loss coefficient. The collector

shows excellent performance on an all-day performance basis, and also for conditions corresponding to temperatures required in solar Rankine systems and/or for low flux level radiation.
Author

N75-31569*# North Carolina State Univ., Raleigh. Dept. of Electrical Engineering.
A THEORETICAL STUDY OF HETEROJUNCTION AND GRADED BAND GAP TYPE SOLAR CELLS Semiannual Status Report
J. R. Hauser and J. E. Sutherland Sep. 1975 8 p
(Grant NsG-1116)
(NASA-CR-143439) Avail: NTIS HC $3.25 CSCL 10A

Heterojunction and graded band gap type solar cells are theoretically investigated. A computer program is developed to account for energy band gap variations and the resulting built-in electric fields which result from heterojunctions and graded energy band gaps. This program is used in studying solar cell operation under various optical irradiation conditions. Results are summarized. Author

N75-31570*# Old Dominion Univ., Norfolk, Va. School of Engineering.
INVESTIGATION OF CURRENT UNIVERSITY RESEARCH CONCERNING ENERGY CONVERSION AND CONSERVATION IN SMALL SINGLE-FAMILY DWELLINGS Final Technical Report, 7 Apr. - 7 Aug. 1975
G. R. Grossman and A. S. Roberts, Jr. 7 Aug. 1975 87 p refs
(Grant NsG-1172)
(NASA-CR-143430; TR-75-T11) Avail: NTIS HC $4.75 CSCL 10A

An investigation was made of university research concerning energy conversion and conservation techniques which may be applied in small single-family residences. Information was accumulated through published papers, progress reports, telephone conversations, and personal interviews. A synopsis of each pertinent investigation is given. Finally, a discussion of the synopses is presented and recommendations are made concerning the applicability of concepts for the design and construction of NASA-Langley Research Center's proposed Technology Utilization House in Hampton, Virginia. Author

N75-31571*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
BENEFIT-COST METHODOLOGY STUDY WITH EXAMPLE APPLICATION OF THE USE OF WIND GENERATORS Final Report
R. P. Zimmer, C. G. Justus, R. M. Mason, S. L. Robinette, P. G. Sassone, and W. A. Schaffer Jul. 1975 411 p refs
(Contract NAS3-17827)
(NASA-CR-134864; A-1645) Avail: NTIS HC $10.50 CSCL 10A

An example application for cost-benefit methodology is presented for the use of wind generators. The approach adopted for the example application consisted of the following activities: (1) surveying of the available wind data and wind power system information, (2) developing models which quantitatively described wind distributions, wind power systems, and cost-benefit differences between conventional systems and wind power systems, and (3) applying the cost-benefit methodology to compare a conventional electrical energy generation system with systems which included wind power generators. Wind speed distribution data were obtained from sites throughout the contiguous United States and were used to compute plant factor contours shown on an annual and seasonal basis. Plant factor values (ratio of average output power to rated power) are found to be as high as 0.6 (on an annual average basis) in portions of the central U. S. and in sections of the New England coastal area. Two types of wind power systems were selected for the application of the cost-benefit methodology. A cost-benefit model was designed and implemented on a computer to establish a practical tool for studying the relative costs and benefits of wind power systems under a variety of conditions and to efficiently and effectively perform associated sensitivity analyses. Author

N75-31572*# Globe-Union, Inc., El Monte, Calif. Centralab Semiconductor.
EFFECTS OF PROCESSING ON THE CARRIER LIFETIME IN SILICON SOLAR CELLS
P. A. Iles and S. I. Soclof Feb. 1975 107 p refs
(Contract NAS3-15689)
(NASA-CR-134520) Avail: NTIS HC $5.25 CSCL 10A

Measurements were taken to determine the effects that solar cell processing steps have on the minority carrier lifetime in silicon. The experimental work included measurements of diffusion lengths of the silicon at various stages of cell fabrication, of solar cell properties, and of the PN junction properties for ingots covering a wide range of doping and other ingot properties. Resistivities covered the range of 0.01 to 10 ohm-cm, and combinations of extreme concentrations (high and low) of dislocations and oxygen were included. The results showed that the major cell process steps did not usually cause any appreciable change in diffusion lengths. The solar cell currents obtained supported the diffusion length measurements. The effects of heavy doping concentrations on solar cell performance were studied. Attempts were made to relate the voltage behavior of the cells with the diode properties and the properties of the ingots.
Author

N75-31573*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TECHNOLOGY SURVEY OF ELECTRICAL POWER GENERATION AND DISTRIBUTION FOR MIUS APPLICATION
William L. Gill and Tony E. Redding Jul. 1975 72 p refs
(NASA-TM-X-58127; JSC-08661) Avail: NTIS HC $4.25 CSCL 10B

Candidate electrical generation power systems for the modular integrated utility systems (MIUS) program are described. Literature surveys were conducted to cover both conventional and exotic generators. Heat-recovery equipment associated with conventional power systems and supporting equipment are also discussed. Typical ranges of operating conditions and generating efficiencies are described. Power distribution is discussed briefly. Those systems that appear to be applicable to MIUS have been indicated, and the criteria for equipment selection are discussed. Author

N75-31574# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID ELECTROLYTES AND PHOTOELECTROLYSIS Semiannual Technical Summary Report, 1 Mar. - 31 Dec. 1974
John B. Goodenough, Kirby Dwight, Jr., Henry Y-P. Hong, James A. Kafalas, and John G. Mavroides 31 Dec. 1974 31 p refs
(Contract F19628-73-C-0002; DARPA Order 2696)
(AD-A009145; ESD-TR-75-108) Avail: NTIS CSCL 10/3

Three classes of cubic skeleton structures were explored for fast Na ion transport for use as solid electrolytes in Na-S batteries. The cubic KSbO3 structure consists of an SbO3(-) skeleton having (III) tunnels intersecting at origin and body-center positions. NaSbO3 and NaSbO3-(1/6)NaF disks of about 95 percent theoretical density give a Na ion resistivity at 300 C approximately equal to 13 ohm-cm and an activation energy of approximately 0.35 eV. Preliminary investigations of aluminosilicates having the carnegieite structure show promise, but a resistivity approximately equal to 610 ohm-cm is the best that was achieved. The use of inexpensive, n-type hot pressed TiO2 powders as the working photocatalytic electrode for achieving photoelectrolysis of water was investigated. A study of the physics and electrochemisty of a photoelectrolysis cell consisting of TiO2 as the anode and platinized platinum as the cathode led to an optimization of the parameters of the system. GRA

N75-31575# National Bureau of Standards, Boulder, Colo. Inst. for Basic Standards.
SELECTED TOPICS ON HYDROGEN FUEL Final Report
W. R. Parrish, R. O. Voth, J. G. Hust, T. M. Flynn, and J. Hord May 1975 215 p refs
(COM-75-10619/5; NBS-SP-419) Avail: NTIS MF $2.25; SOD HC as C13.10:419 CSCL 21D

A summary report on selected hydrogen-fuel topics is given. These data were prepared to identify cost and technical barriers to the commercial use of hydrogen fuel and to generate reference data for policy-planning, decision-making and design. Cryogenic hydrogen fuel technology is emphasized in the economic and systems analyses. Research and development needs within

selected areas of NBS competence are identified and future research plans are outlined. GRA

N75-31576# Naval Ship Research and Development Center, Annapolis, Md. Propulsion and Auxiliary Systems Dept.
INVESTIGATION OF SHIPBOARD DISTILLING PLANT ENERGY CONSUMPTION
B. H. Rankin, W. B. Huckenpoehler, and W. L. Adamson May 1975 67 p
(AD-A009804; PAS-74-60) Avail: NTIS CSCL 07/1

Technical manual data on shipboard freshwater distillers were used to perform energy balances on various ship distilling units and obtain quantitative figures on the energy consumed to produce desalinated water. Similar energy balances were carried out on distillation systems as installed aboard particular ships. The latter analysis, which used ship design heat balances (or trial heat balances when available) to calculate the energy per pound of water, took into account the interaction between the ship steam propulsion plant and the distillers. The results showed that, for the 12 ships examined, the calculated energy consumption averaged 434 British thermal units per pound of freshwater produced as compared to 601 British thermal units per pound based upon the manufacturer's technical manual data. Boiler and electrical conversion inefficiencies were found to have a measurable contribution to the overall distiller energy consumption. GRA

N75-31577# Honeywell, Inc., Horsham, Pa. Power Sources Center.
RESERVE LOW TEMPERATURE LITHIUM-ORGANIC ELECTROLYTE BATTERY Final Report, Apr. 1973 - Mar. 1974
C. Richard Walk Feb. 1975 88 p refs
(Contract DAAB07-73-C-0140; DA Proj. 1G7-63702-DG-10)
(AD-A009784; ECOM-73-0140-F) Avail: NTIS CSCL 10/3

A 750 mAH reserve low temperature lithium-organic electrolyte battery along with a unique activation mechanism was manufactured and packaged as a single unit. The development phase of the contract culminated with the preparation of a Preliminary Design and Visualization Plan (PDVP) which demonstrated the capabilities of the units. A build of 135 units followed approval of the PDVP. Thirty-five units were tested by Honeywell and 100 units were delivered to the U.S. Army Electronics Command. Problems encountered and improvements made during development, manufacture and test of the units are discussed. GRA

N75-31578# EIC, Inc., Newton, Mass.
LITHIUM-INORGANIC ELECTROLYTE BATTERIES Quarterly Report, 16 Sep. - 15 Dec. 1974
Gerhard L. Holleck Apr. 1975 30 p refs
(Contract DAAB07-74-C-0030; DA Proj. 1T1-61102-A-34A)
(AD-A009782; C-401-5; ECOM-74-0030-5; QR-5) Avail: NTIS CSCL 10/3

An all-inorganic electrolyte, lithium primary battery operable over the temperature range -40 to +160F is being evaluated. The desired energy density is 150 watt-hours per pound of total battery weight and the desired power density is 50 watts per pound. Sulfur is a reaction product of Li/SOCl2 cells. Fifty percent (50%) of the total sulfur content of reacted SOCl2 is found by chemical analysis of elemental sulfur. Sulfur is quite soluble in the electrolyte. Analysis by gas chromatography indicates that SO2 is a reaction product, but no other major volatile products are formed. Reduction of SOCl2 on Ni, Pt, Au and C is a complex, potential dependent process. Surface layers are formed on all these electrodes and interfere with reduction of SOCl2. After high temperature storage, Li/SOCl2 batteries showed severe voltage delays and voltage depression due to Li electrode polarization. The protective film on Li breaks only locally leading to localized anodic Li dissolution at high current densities. GRA

N75-31579# Oceanic Foundation, Waimanalo, Hawaii.
SEAWARD EXTENSION OF URBAN SYSTEMS: THE FEASIBILITY OF OFFSHORE COAL-FIRED ELECTRICAL POWER GENERATION
Isao Roy Yumori Jan. 1975 125 p
(Grant NOAA-04-3-158-29)
(COM-75-10592/4; UNIHI-SEAGRANT-CR-75-02; TR-7; NOAA-75041807) Avail: NTIS HC $5.25 CSCL 10B

With dwindling supplies and escalating costs of petroleum, coal appears to offer the most attractive near-term energy resource, particularly for stationary electrical power generation. This report explores three configurations of offshore coal-fired electrical power plants in the 500 Mw capacity range and chooses a pylon moored barge configuration for more detailed study. Ocean siting is technically feasible and, since certain ocean siting economic advantages (assembly line production and inexpensive fuel delivery, and the obviated need for site preparation and cooling towers) can balance the increased costs of marine structures and underwater cables, it can be economically attractive as well. GRA

N75-31580# Defense Documentation Center, Alexandria, Va.
ENERGY CONVERSION Report Bibliography, Aug. 1973 - Nov. 1974
Apr. 1975 145 p refs
(AD-A009600; DDC-TAS-75-6) Avail: NTIS CSCL 10/1

This bibliography presents a brief scattering of abstracts of DOD research reports concerned with energy conversion. GRA

N75-31581# Illinois Univ., Urbana. Water Resources Center.
PROCEEDINGS OF THE WORKSHOP ON RESEARCH NEEDS RELATED TO WATER FOR ENERGY
Glenn E. Stout Nov. 1974 299 p refs Workshop held at Indianapolis, 20-22 Oct. 1974
(Contract DI-14-31-0001-4271)
(PB-241346/6; UILU-WRC-74-0093; W75-07089; OWRT-X-147(4271)(1)) Avail: NTIS HC $8.75 CSCL 10A

Development of large scale energy conversion facilities and their impact on water resources in the Ohio River, Great Lakes and Upper Mississippi River basins was studied at an interdisciplinary workshop. Within limits determined by available water resources and minimization of environmental impact, participants identified areas in which research will be needed if energy conversion facilities are developed. Coal gasification and liquefaction received special emphasis. Included are two papers on coal conversion processes and related water requirements, nine papers with commentaries related to main topic and reports of discussion groups which identify research needs and rank them in importance. GRA

N75-31582# Federal Energy Administration, Washington, D.C. Office of Energy Data Policy.
SOLAR ENERGY PROJECTS OF THE FEDERAL GOVERNMENT
Howard L. Magnus Jan. 1975 133 p refs
(PB-241620/4; FEA/C-75/247) Avail: NTIS HC $6.25 CSCL 10A

This report identifies 171 solar energy projects administered by 14 different Federal agencies between July 1973 and January 1975. Solar categories included are: heating and cooling of buildings; wind energy conversion; solar thermal conversion; ocean thermal conversion; photovoltaic electric power systems; and bioconversion to fuels. An introductory chapter provides an overview and analysis of the Federal effort in solar energy and categorizes projects by agency, the amount of funding, and the major program areas. Appendices provide brief summaries of each of the 171 projects. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-31583 North Carolina State Univ., Raleigh.
AN AUTOMOTIVE EMISSIONS POLICY SIMULATOR WITH ILLUSTRATIVE APPLICATION TO THE ANALYSIS OF COSTS AND BENEFITS OF WAITING FOR IMPROVED CONTROL TECHNOLOGY Ph.D. Thesis
Dennis Joseph Kulonda 1974 214 p
Avail: Univ. Microfilms Order No. 75-15155

A continuous simulation model relating automobile sales, retirements, usage, and emissions that may be used as a tool

for automative emission policy analysis was developed. Its use in policy analysis was illustrated through an assessment of the costs and benefits of waiting for the development of stratified charge technology as opposed to pursuing the present automotive emissions control program. Severity weighting schemes were used for aggregating automotive emission reductions from a base level as a measure of benefits. Predictions of annual average emission levels and control costs were developed on a nationwide basis from 1970 to 1990 for each alternative policy. It was shown that consumers would incur substantial savings, with little apparent sacrifice in nationwide air quality, if emission control compliance times were deferred to permit the development of the stratified charge technology. Dissert. Abstr.

N75-31584*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
AIR POLLUTION FROM AIRCRAFT Semiannual Progress Report, Feb. - Aug. 1975
John B. Heywood and Norman A. Chigier (Sheffield Univ.) 25 Aug. 1975 20 p
(Grant NGR-22-009-378)
(NASA-CR-143427) Avail: NTIS HC $3.25 CSCL 13B

A model which predicts nitric oxide and carbon monoxide emissions from a swirl can modular combustor is discussed. A detailed analysis of the turbulent fuel-air mixing process in the swirl can module wake region is reviewed. Hot wire anemometry was employed, and gas sampling analysis of fuel combustion emissions were performed. Author

N75-31585*# AeroChem Research Labs., Inc., Princeton, N.J.
NO SUB x DEPOSITED IN THE STRATOSPHERE BY THE SPACE SHUTTLE, PHASE 1 Final Summary Report
Harold S. Pergament and Roger D. Thorpe Jul. 1975 28 p refs
(Contract NAS1-13544)
(NASA-CR-132715; AeroChem-TN-161) Avail: NTIS HC $3.75 CSCL 13B

The results of calculations to determine the amount of NOx deposited in the stratosphere by space shuttle solid rocket motors (SRM) are presented. Flow properties and chemical composition in the exhaust nozzle and plume were analyzed. The nozzle calculations show that about 4.5 lbm/sec of NOx leaves the two SRMs. The total amount of NOx deposited in the stratosphere is related to the amount leaving the nozzle via an overall plume enhancement factor (OPEF), which depends upon the influence of afterburning and shocks in enhancing the exit plane NOx mole fraction. Calculations show that the OPEF is approximately 2, indicating the mass flow of NOx in the plume to be approximately 10 lbm/sec at 30 km altitude with a possible error factor of 4. For a vehicle velocity of 3750 ft/sec, therefore, the NOx deposition rate in the stratosphere is about 2.7 x 10(-3) lbm/ft. Author

N75-31586# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION. PART 1: SMOKE AND SULFUR DIOXIDE. PART 2: PRECIPITATION MEASUREMENTS USING STORAGE GAGES Monthly Bulletin, Aug. 1973 [POLLUTION ATMOSPHERIQUE I. FUMEE ET SO2 II.-MESURE DES RETOMBEES AU MOYEN DES JAUGES DE DEPOT]
Aug. 1973 37 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $3.75

Data obtained at Belgian weather stations for August 1973 are tabulated. The air pollution apparatus and rain gage are briefly described. ESRO

N75-31587# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION. PART 1: SMOKE AND SULFUR DIOXIDE. PART 2: PRECIPITATION MEASUREMENTS USING STORAGE GAGES Monthly Bulletin, Sep. 1973 [POLLUTION ATMOSPHERIQUE I. FUMEE ET SO2 II.-MESURE DES RETOMBEES AU MOYEN DES JAUGES DE DEPOT BULLETIN MENSUEL, SEPTEMBRE 1973]
Sep. 1973 37 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $3.75

Data obtained at Belgian weather stations for September 1973 are tabulated. The air pollution apparatus and rain gage are briefly described. ESRO

N75-31588# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION. PART 1: SMOKE AND SULFUR DIOXIDE. PART 2: PRECIPITATION MEASUREMENTS USING STORAGE GAGES Monthly Bulletin, Oct. 1973 [POLLUTION ATMOSPHERIQUE I. FUMEE ET SO2 II.-MESURE DES RETOMBEES AU MOYEN DES JAUGES DE DEPOT BULLETIN MENSUEL, OCTOBRE 1973]
Oct. 1973 37 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $3.75

Data obtained at Belgian weather stations for October 1973 are tabulated. The air pollution apparatus and rain gage are briefly described. ESRO

N75-31589# PEDCO-Environmental Specialists, Inc., Cincinnati, Ohio.
AIR POLLUTION CONSIDERATIONS IN RESIDENTIAL PLANNING. VOLUME 1: MANUAL Final Report
T. M. Briggs, M. Overstreet, A. Kothari, and T. W. Devitt Jul. 1974 174 p refs Sponsored in part by HUD
(Contract EPA-68-02-1089)
(PB-240997/7; EPA-450/3-74-046a-Vol-1) Avail: NTIS HC $6.25 CSCL 13B

Methods are presented to determine the short term worst case concentrations at specific site locations of carbon monoxide from roadways and parking lots and particulate and sulfur dioxide from point sources and space heating. Procedures are also presented to convert total outdoor pollutant concentrations to indoor levels as a function of building structural characteristics. Outdoor and indoor pollutant levels are compared to air quality standards to determine site acceptability. Recommended design practices are also presented to aid the planner in minimizing the impact of air pollution on residents of the development. GRA

N75-31590# PEDCO-Environmental Specialists, Inc., Cincinnati, Ohio.
AIR POLLUTION CONSIDERATIONS IN RESIDENTIAL PLANNING. VOLUME 2: BACKUP REPORT Final Report
T. M. Briggs, M. Overstreet, A. Kothari, and T. W. Devitt Jul. 1975 105 p refs Sponsored in part by HUD
(Contract EPA-68-02-1089)
(PB-240998/5; EPA-450/3-74-046b-Vol-2) Avail: NTIS HC $5.25 CSCL 13B

The technical basis is presented for the air quality estimation procedures presented in the manual. Included are the justification for selecting only particulates, SO2, and CO for study, and the basis of the air quality criteria levels. A detailed description of the method for converting outdoor pollutant levels to indoor concentrations is also presented. Limitations of the manual's procedures are presented together with recommendations for future research. GRA

N75-31591# Missouri Univ., Columbia. Dept. of Sanitary Engineering.
INTERACTING CARBON AND LIGHT LIMITS TO ALGAL GROWTH M.S. Thesis
Ronald E. King Aug. 1974 85 p refs
(Contract DI-14-31-0001-4025)
(PB-241517/2; W75-07357; OWRT-A-071-MO(1)) Avail: NTIS HC $4.75 CSCL 06F

Two separate investigations were conducted. The first was to evaluate the differences of algae ability to extract carbon from a single concentration of carbonate-bicarbonate alkalinity under different light intensities and, the second, to evaluate the ability of algae to extract carbon from different carbonate-bicarbonate alkalinities at a single constant light intensity. The test algae were Pediastrum biradiatum, Scenedesmus acutiformis, Anabaena variabilis, and Phormidium olivacea. The free carbon dioxide concentration at which the algae became carbon limited varied with both light intensity and type of algae. The relations of the specific algal growth rate to light intensity follows the Monod equation reasonably well. The relations of the specific growth rate to free carbon dioxide concentration follows the

Monod equation only at high concentrations of free carbon dioxide. GRA

N75-31592# Army Scientific Advisory Panel, Washington, D.C.
ARMY SCIENTIFIC ADVISORY PANEL AD HOC GROUP ON ENVIRONMENTAL QUALITY CONTROL
Feb. 1975 22 p refs
(AD-A009191) Avail: NTIS CSCL 13/2

In response to an increasing national environmental awareness and to legislative and regulatory mandates, the Army initiated an Environmental Quality Control (EQC) Research and Development program, with separate identifiable efforts. Because of deadlines imposed by these legislative and regulatory mandates to curtail or reduce pollution levels in specific areas and specific facilities, the initial thrust of the program was devoted to finding quick solutions to the immediate problems. In view of the above, an ASAP Ad Hoc Group was established to review the Army's EQC Research and Development Program. The report discusses areas of concern and presents recommendations. GRA

N75-31593# Environmental Health Lab., McClellan AFB, Calif.
AIR POLLUTION SOURCE SURVEY, EDWARDS AIR FORCE BASE, CALIFORNIA Final Report
Kenneth E. Hundley Apr. 1974 86 p refs
(EHL Proj. M-AAF-328)
(AD-A009472; EHL-M-74M-4) Avail: NTIS CSCL 13/2

Particulate emissions, plume opacities and detailed stack sampling results are presented for the hospital pathological incinerator at Edwards AFB CA. This test was performed to determine compliance with Kern County APCD Rules and Regulations. Sampling procedures given in PHS Specifications for Incinerator Testing at Federal Facilities plus Addendum and CFR, Title 40, Chapter I, Subchapter C, Pt. 60, were followed as closely as practical during tests. GRA

N75-31594# KVB Engineering, Inc., Tustin, Calif.
REDUCTION OF NOx THROUGH STAGED COMBUSTION IN COMBINED CYCLE SUPPLEMENTAL BOILERS. VOLUME 1: SYSTEMS OPTIMIZATION ANALYSES Final Report
Feb. 1975 79 p refs
(PB-241463/9; EPRI-224-Vol-1) Avail: NTIS HC $4.75 CSCL 21B

Control of emissions from supplemental-fired combined cycles with the use of staged combustion in the steam generating portion of the system is investigated. Staged combustion is achieved by the separation of the exhaust from the gas turbines into two streams prior to entering the steam generator with provisions for primary combustion of fuel in one stream with a deficiency of air. Combustion is completed in a secondary stage by mixing the unfired stream into the products of the fired stream. The use of staged combustion provides conditions favorable for the occurrence of chemical reactions that result in a reduction of mass flow of nitric oxide (NO) present in the gas turbine exhaust. An engineering analysis of combined cycle performance is presented along with a discussion of the NOx reduction potential. GRA

N75-31595# KVB Engineering, Inc., Tustin, Calif.
REDUCTION OF NOx THROUGH STAGED COMBUSTION IN COMBINED CYCLE SUPPLEMENTAL BOILERS. VOLUME 2: EXPERIMENTAL PROGRAM Final Report
Feb. 1975 101 p refs
(PB-241464/7; EPRI-224-Vol-2) Avail: NTIS HC $5.25 CSCL 21B

The experimental program and results of an investigation of stages combustion in combined cycle (steam-gas turbine) electric power generation for the reduction of NOx in the exhaust gases is described. Several burner configurations were tested, and various flow schemes and air fuel ratios were used. GRA

N75-31596# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
AIR QUALITY DATA: 1973 FOURTH QUARTER STATISTICS Quarterly Report, Oct. - Dec. 1973
Dec. 1973 124 p refs
(PB-241807/7; EPA-450/2-74-014) Avail: NTIS HC $5.25 CSCL 13B

This report is a statistical summary report on ambient air quality submitted to EPA from air monitoring operations of state, local and federal networks. GRA

N75-31597# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
AIR QUALITY DATA: 1973 ANNUAL STATISTICS Annual Report, 1973
Nov. 1974 145 p refs
(PB-241808/5; EPA-450/2-74-015) Avail: NTIS HC $5.75 CSCL 13B

This report is a statistical summary report on ambient air quality submitted to EPA from air monitoring operations of state, local and federal networks. GRA

N75-31598# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION: REPORT 17-2 FEASIBILITY STUDY
Douglas G. Outlaw, Donald L. Durham, D. Donald Davidson, and Robert W. Whalin Apr. 1975 118 p refs
(AD-A009729; AEWES-TR-H-74-6-17-2) Avail: NTIS CSCL 01/5

The conclusions and recommendations of the U.S. Army Engineer Waterways Experiment Station's study of the feasibility of using physical hydraulic models to estimate the effects of the proposed Lake Erie International Jetport on lake hydrodynamics are presented. The physical models considered are mass circulation, wave action, breakwater stability, and longshore littoral transport models. For circulation models, similitude requirements, scales, model verification, and advantages and limitations are considered for (1) a rotating lake model, (2) a rotating model of a section of the lake near Cleveland, and (3) a nonrotating model of a section of lake near Cleveland, all with wind-driven circulation. A fourth circulation model, similar to (3), with slope (gravity) currents is also discussed. GRA

N75-31599# Versar, Inc., Springfield, Va. General Technologies Div.
IDENTIFICATION OF ORGANIC COMPOUNDS IN EFFLUENTS FROM INDUSTRIAL SOURCES Final Report
Ed F. Abrams, D. Derkics, C. V. Fong, D. K. Guinan, and K. M. Slimak Apr. 1975 211 p refs
(Contract EPA-68-01-2926)
(PB-241641/0; EPA-560/3-75-002) Avail: NTIS HC $7.25 CSCL 13B

Initial assessment of the possible sources of 154 organic compounds which identified in drinking water supplies is given. It lists those chemicals which may be formed by chlorination of sewage treatment or water treatment, from leachates from natural sources, and those which may be from industrial effluents. Appendix C has a data sheet for each chemical which shows possible sources, its biodegradability and effective treatment. GRA

N75-31600# Woods Hole Oceanographic Institution, Mass.
THE USE OF FLOWING BIOLOGICAL SYSTEMS IN AQUACULTURE, SEWAGE TREATMENT, POLLUTION ASSAY AND FOOD-CHAIN STUDIES Technical Report, 1 Jan. - 31 Dec. 1973
John H. Ryther 15 Jul. 1974 371 p refs
(PB-241529/7; NSF/RA/E-74-038; NSF-GI-32140) Avail: NTIS HC $10.00 CSCL 06C

The study is concerned with the growth and nutrient-uptake kinetics of several species of marine phytoplankton. These were studied by means of chemostat culture techniques in an attempt to determine the optimal combination of sewage effluent and seawater in the medium, algal yield, and nutrient utilization consistent with the concept of combined tertiary-treatment aquaculture system. Output from the continuous algal cultures was fed to juvenile oysters in an attempt to determine growth of the molluscs as a function of algal food species. Other, separate experiments were conducted to determine the effect of concentration of a single diatom species, Phaedactylum tricornutum, on the rate and efficiency of food assimilation deposition (as feces

and pseudofeces) and growth of juvenile oysters. These and other aspects of the study are fully detailed. GRA

N75-31601# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
ECONOMICALLY OPTIMAL DESIGN OF PARTICULATE AIR POLLUTANT CONTROL EQUIPMENT Ph.D. Thesis - Illinois Univ., Urbana
Charles W. Stone Jan. 1975 155 p refs
(AD-A009868; ASD/XR-TR-75-2) Avail: NTIS CSCL 07/1

An analytical study of the economically optimal design of particulate air pollutant control equipment is presented. Two major control equipment types, electrostatic precipitators and cyclones, are modeled and optimized with respect to total system economics. The equipment models are defined as a combination of functional elements. Basic mathematical definitions of particle distribution functions, particle collection efficiency, gas flow parameters and gas ionization are employed in the derivation of the various functional elements. The electrostatic precipitator model is developed and optimized using three functional elements. These elements are defined as electrical power requirements, gas flow/pressure drop and the economic considerations of precipitation. The electrostatic precipitator model resulting from the integration of the three functional elements is of such a degree of complexity when examined as a whole that it is more practical to optimize the individual elements. The tangential inlet cyclone model is developed and optimized using two functional elements. These elements are defined as power requirements and cyclone economics. Empirical equations defining the particle collection efficiency and pressure drop of a cyclone system are employed in the formulation of the power requirements model. GRA

N75-31602# Metropolitan Transportation Commission, Berkeley, Calif.
ENVIRONMENT PROJECT. PRELIMINARY FINDINGS REGIONAL AIR EMISSIONS
Mar. 1975 17 p refs Prepared in cooperation with De Leuw, Cather and Co., Inc., Washington, D. C. Sponsored by Metropolitan Transportation Commission, Berkeley, Calif.
(Contract DOT-OS-30176)
(PB-241697/2; MTC-TM-14-4-75) Avail: NTIS HC $3.25 CSCL 13B

This study presents findings relative to changes in the emission of automobile generated pollutants (CO, HC and NOx) resulting from VMT (vehicle miles traveled) changes associated with the use of BART (Bay Area Rapid Transit). The effect of changing VMT on emission of pollutants is assessed for both the total 9-county Bay Area airshed and for the 3-county BART service area. The findings are related to the Control Strategy Plan for the San Francisco Bay Area. GRA

N75-31603# Brier (Glenn W.), Fort Collins, Colo.
STATISTICAL QUESTIONS RELATING TO THE VALIDATION OF AIR QUALITY SIMULATION MODELS Final Report
Mar. 1975 25 p refs Sponsored by EPA
(PB-241866/3; EPA-650/4-75-010) Avail: NTIS HC $3.25 CSCL 04B

This study examines some of the statistical problems that arise in the validation and evaluation of air quality models. It considers the various scores or indices that can be used in measuring the predictive accuracy of a model and shows how the verification statistics are affected by errors in the input and output data and imperfections in the model. Suggestions are made regarding the major problem of separating input-output data errors from those introduced by a poor mathematical representation of the physical and chemical processes, and recommendations are made regarding validation procedures to be followed as the RAPS data base becomes available. GRA

N75-31604# Bureau of Mines, Morgantown, W.Va. Morgantown Energy Research Center.
REMOVAL OF HYDROGEN SULFIDE FROM HOT PRODUCER GAS BY SOLID ABSORBENTS
W. T. Abel, F. G. Shultz, and P. F. Langdon Dec. 1974 30 p refs Previously announced as N74-31591
(PB-241878/8; BM-RI-7947; N74-31591) Avail: NTIS HC $3.75 CSCL 07A

Forty-eight materials were tested for their ability to absorb H2S from hot simulated producer gas (1,000F to 1,300F). The material found best from the standpoint of absorption capacity, durability and amendability to regeneration was sintered pellets of 75 percent fly ash - 25 percent Fe2O3. The performance of this absorbent under simulated and actual conditions are described. The effect of absorbent composition, absorbent temperature, steam content of the gas and tar vapors, and dust in producer gas are discussed. GRA

N75-31605# Rensselaer Polytechnic Inst., Troy, N.Y.
CHEMICAL ADDITIVES FOR IMPROVEMENT OF OIL SPILL CONTROL Final Report, 6 Aug. 1973 - 6 Aug. 1974
W. H. Bauer, D. N. Borton, J. J. Bulloff, and S. Ross Aug. 1974 195 p refs
(Contract DOT-CG-33755-A)
(AD-A009019; USCG-D-83-75) Avail: NTIS CSCL 13/2

Chemical additives for improving oil spill control were studied. A state of art report, bibliography and evaluation were prepared. Drum and belt driven oil flow simulation tanks for oil control study were developed. Sixteen oils tested showed initial dropletting and entrainment for oil slicks on water at 0.3 to 0.6 knots, with no correlation between viscosity, density or interfacial tension. The most effective additives were non-toxic oil soluble hydrocarbon polymers, polyethylenes and ethylene-propylene copolymers, useful at concentrations, raising initial entrainment speeds to 2 knots, short of a 10 knot objective. Surface active agents did not inhibit dropletting or promote coalescence of oil or oily drops. Author (GRA)

N75-31606# Academy of Natural Sciences of Philadelphia, Pa.
THE ROLE OF TRACE ELEMENTS IN MANAGEMENT OF NUISANCE GROWTHS Final Report, 1 Apr. 1970 - 31 Mar. 1974
Ruth Patrick, Thomas Bott, and Richard Larson Apr. 1975 261 p refs
(Grant EPA-R-800731)
(PB-241985/1; EPA-660/2-75-008) Avail: NTIS HC $8.50 CSCL 06F

The purpose of these studies was to examine the effects of various kinds and amounts of trace metals on the structure of algal communities and their possible subsequent effect upon the productivity of the aquatic ecosystem. To carry out this program of study, the following trace metals were examined: (1) vanadium, (2) chromium, (3) selenium, (4) boron, (5) nickel, and (6)rubidium. The results of these experiments indicate the concentration and form of a trace metal may have a definite effect upon which algal species can out-compete others. These shifts may greatly reduce the productivity of the system as a whole. GRA

N75-31607# Illinois Univ., Chicago. Environmental Health Resource Center.
HEALTH IMPLICATIONS OF THE CATALYTIC CONVERTER Final Report
Feb. 1975 48 p refs Sponsored by Illinois Inst. for Environ. Quality
(PB-241610/5; EHRC-13; IIEQ-75-09) Avail: NTIS HC $3.75 CSCL 06E

The reduction of hydrocarbons (HC), CO, NO, total oxygenates, and certain aromatics by using the catalytic converter is reported. Also, ozone levels and atmospheric lead were reduced. There are, however, several adverse effects which could result from use of the catalytic converter: (1) recent tests indicate that these devices emit sulfates and sulfuric acid, both of which would have adverse health impacts, (2) if manganese is used to replace lead in gasoline ambient manganese levels could increase, (3) the disposal of the spent catalytic materials, (e.g. platinum and palladium) may cause additional environmental health problems, and (4) mechanical failure of the converter will allow the automobile to emit as much pollution as the 1968 model. GRA

N75-31608# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
STATE AIR POLLUTION IMPLEMENTATION PLAN Progress Report, 1 Jul. - 31 Dec. 1974
Apr. 1975 103 p refs
(PB-241494/4; EPA-450/2-75-003) Avail: NTIS HC $5.25 CSCL 13B

All 55 State Implementation Plans (SIPs) are in the process of being amended. The number of fully approved SIPs has dropped from 3 to 0, partly because EPA, in response to court orders, proposed or promulgated regulations for non-significant deterioration, variances and enforcement orders, and public availability of data. Issues that affect the SIP process and the complexities inherent in the SIP framework are discussed. The number of major emitters identified has increased to 19,200; 70 percent of these are now in compliance with an emission standard or an acceptable compliance schedule. The goal of attaining ambient air quality standards will probably not be achieved in all AQCRs by the statutory deadlines, but the SIP process is accomplishing reductions in ambient levels of the criteria pollutants on a nationwide basis. Author

N75-31609# Environmental Protection Agency, Research Triangle Park, N.C.
PRESENTATION OF NEDS EMISSION DATA FOR AIR POLLUTION STUDIES Final Report
Richard C. Haws Nov. 1974 53 p
(Contract EPA-68-02-1096)
(PB-241491/0; EPA-450/3-75-026) Avail: NTIS HC $4.25 CSCL 13B

The National Air Data Branch (NADB) has the responsibility to gather source emission, air quality, and related information from 55 states and territories into a single nation air data management information system. The purpose of this report is to provide researchers in the field of criteria air pollutant emissions with a background of what data are available in NEDS, both in edited form and in summaries, and what types of summaries and analyses are included with short discussions of the method of preparation of each and some of the required and/or optional input parameters associated with each. GRA

N75-31610# Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
FINANCIAL INCENTIVES AND POLLUTION CONTROL: A CASE STUDY
Terry A. Ferrar, Alan B. Brownstein, John D. Simpson, and Sally Streiter Apr. 1975 59 p refs
(Contract EPA-68-01-2250)
(PB-241479/5; EPA-600/5-75-007) Avail: NTIS HC $4.25 CSCL 13B

Confronted with shortages of low-sulfur content residual fuel oil, several air pollution control authorities in the northeastern states were forced to relax air quality standards during the winters of 1972-73 and 1973-74. The authorities did so by granting variances to their sulfur-content standards for residual fuel oil. The characteristics of these variances provide the social test-tube or this analysis. The report examines alternative policies such as direct regulation, fuel-oil surcharges, emission taxes and quantity control. GRA

N75-31611# Indian National Scientific Documentation Centre, New Delhi.
AIR PURIFICATION, VOLUME 8, NUMBER 6
1974 198 p refs Transl. into ENGLISH from Kuki Seijo (Japan), v. 8, no. 6, Dec. 1970
(Contract NSF C-466)
(TT-70-57210/6) Avail: NTIS HC $7.00 CSCL 13B

Topics considered are: (1) respective determinination of NO and NO2; (2) study on localized dust pollution and its measuring technique; (3) the cascade centripeter for particle size determination and its application to chemical analysis by the ring oven; (4) research on the measurement of particulates in the air with low volume air sampler; (5) studies on regional representative value of air pollution; (6) the influence of aerial bacteria with special reference to pathogenic staphylococcus E.; (7) new concept in clean room design; and (8) standard for measurement of air ion concentration in environmental atmosphere. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N75-31612 Texas Univ., Austin.
ROTATIONAL DYNAMICS OF MATHEMATICAL MODELS OF THE NONRIGID EARTH Ph.D. Thesis
Braulio Valentin Sanchez 1975 250 p
Avail: Univ. Microfilms Order No. 75-16734

An investigation is made of the rotational dynamics of a deformable, nonrigid earth and its time-varying gravitational field. The concept of the potential Love number is developed by means of potential equilibrium theory under the assumption of a radial distribution of density. An expression is developed for the sum of the moments of inertia of a deformable body under the influence of disturbing forces. It is shown that this expression is a constant if incompressibility is assumed. Approximate analytic solutions to the Liouville equations of motion are presented along with numerical results pertaining to the solution of the equations of motion, including polar motion with respect to a body-fixed coordinate system and motions with respect to an inertial coordinate system and quantitative results for the time-dependent components of the coefficients of the geopotential. Dissert. Abstr.

N75-31613 Texas Univ., Austin.
ATMOSPHERIC ELECTRICITY AND AIR POLLUTION Ph.D. Thesis
William Henry Marlow 1974 243 p
Avail: Univ. Microfilms Order No. 75-16765

The atmospheric electricity and aerosol content of the continental atmospheric boundary layer is reviewed. The flux of small ions, in the near free molecular region of motion, to a spherical aerosol particle is calculated and the results are displayed. The solutions for the flux of ions to a charged particle of the same sign (unipolar flux), to a neutral particle, and to a charged particle of the opposite sign (bipolar flux) are given. These final bipolar, unipolar, and neutral fluxes covering the entire range of Knudsen numbers are used in birth-death equations for the charging of an aerosol in the presence of ions of both signs. Using mobilities and masses representative of the atmospheric ions of the lower troposphere, the time-dependent charge distributions of a variety of monodisperse and poly-disperse aerosols are calculated and the results presented. A device is described which effectively measures the mass and possibly the charge distribution of the atmospheric aerosol. Dissert. Abstr.

N75-31614 Texas Univ., Austin.
ASPECTS OF THE NONLINEAR DYNAMICS OF PLANETARY SCALE BAROTROPIC WAVES Ph.D. Thesis
George Haskell Ward, Jr. 1975 176 p
Avail: Univ. Microfilms Order No. 75-16754

The role of nonlinear effects upon the propagation and development of planetary-scale waves in the atmosphere was investigated. The model employed was the quasi-geostrophic equation restricted to nondivergent barotropic flow on a beta-plane. The nonlinear dynamics of two classes of planetary-wave mechanisms were studied: the development of waves by conversion of energy from the zonal flow (instability) and from other waves (scale interaction), and the latitudinal propagation of waves in the vicinity of a critical level. Scale interactions were found to produce developments with large temporal and spatial variations in wave parameters, whose growth rate and spectral composition cannot be anticipated from linear instability theory. The critical-level behavior was found to be dominated by zonal-flow interaction when wave-wave processes are weak. When wave-wave interactions are significant, some wave energy in the forced wave-numbers can penetrate the critical level by nonlinear conversions. Dissert. Abstr.

N75-31615 Florida State Univ., Tallahassee.
LINEAR STABILITY ANALYSIS OF CISK INDUCED LOW LATITUDE DISTURBANCES Ph.D. Thesis
Walter James Koss 1975 216 p

Avail: Univ. Microfilms Order No. 75-17940

The physical stability of perturbation motions in a conditionally unstable tropical atmosphere at rest is examined under CISK and frictional forcing. The governing linear multi-layer primitive equations are formulated into an eigenvalue problem for the unconditional heating case. This analysis yields propagation speeds, growth rates, and vertical structure for the modes supported by the model. The specified parameters are the vertical distribution of diabatic heating, the base state temperature structure, boundary layer specific humidity, lateral mixing coefficient for momentum and temperature, surface friction coefficient, Coriolis parameter, and perturbation wavelength. Results for both a three layer and a seven layer model are given and discussed. Dissert. Abstr.

N75-31616# Physical Research Lab., Ahmedabad (India).

AN EXPERIMENTAL SYSTEM FOR LABORATORY SIMULATION OF EQUATORIAL ELECTROJET INSTABILITIES

P. I. John and Y. C. Saxena [1975] 16 p refs

(PLA-75-04) Avail: NTIS HC $3.25

An experimental system which simulates the essential characteristics of the equatorial electrojet plasma is described. A description of the components of the system is given. Preliminary results of equilibrium and instability characteristics, the latter obtained by digitally implemented statistical signal analysis techniques are included. Author

N75-31617*# Polytechnic Inst. of New York. Dept. of Meteorology and Oceanography.

BASIC RESEARCH IN METEOROLOGY AND ATMOSPHERIC PHYSICS Final Report, 1 Jan. - 31 Jun. 1975

James E. Miller Jul. 1975 11 p refs

(Grant NsG-5041; Proj. HIAM II)

(NASA-CR-143491) Avail: NTIS HC $3.25 CSCL 04A

The effect was studied of the variations of the electromagnetic properties of the three phases of water on measurements of atmospheric and oceanographic parameters by microwave instruments aboard satellites. Other studies reported include: orbital detection of extrasolar planets, detection of stratospheric aerosols from earth orbit, chemistry of Jupiter's atmosphere, and stratospheric ozone. F.O.S.

N75-31618*# Alabama Univ., Huntsville. School of Graduate Studies and Research.

MULTIFLUIDS DESCRIPTION OF DYNAMICS OF UPPER ATMOSPHERE Final Technical Report

S. T. Wu and R. J. Hung Jul. 1975 89 p refs

(Contract NAS8-29543)

(NASA-CR-143930; UAH-RR-175) Avail: NTIS HC $4.75 CSCL 04A

A multifluids model to investigate ionospheric dynamics was established on kinetic theory. Its resultant equations are used to examine the following dynamic problems in the gamma region of 80-2000 Km of the ionosphere: (1) propagation of acoustic modes in the 500-2,000 Km of the ionosphere (two fluid model); (2) the relation between the cross field plasma drift instabilities and type I and type II ionospheric irregularities; and (3) time dependent neutral wind structure and horizontal pressure gradient. Author

N75-31619*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AN AUTOMATED ATMOSPHERIC SAMPLING SYSTEM OPERATING ON 747 AIRLINERS

Porter Perkins and Ulf R. C. Gustafsson (United Airlines, San Francisco) 1975 15 p refs Presented at Intern. Conf. on Environ. Sensing and Assessment, 14-19 Sep., 1975; sponsored by IEEE

(NASA-TM-X-71790; E-8455) Avail: NTIS HC $3.25 CSCL 04A

An air sampling system that automatically measures the temporal and spatial distribution of selected particulate and gaseous constituents of the atmosphere has been installed on a number of commercial airliners and is collecting data on commercial air routes covering the world. Measurements of constituents related to aircraft engine emissions and other pollutants are made in the upper troposphere and lower stratosphere (6 to 12 km) in support of the Global Air Sampling Program (GASP). Aircraft operated by different airlines sample air at latitudes from the Arctic to Australia. This system includes specialized instrumentation for measuring carbon monoxide, ozone, water vapor, and particulates, a special air inlet probe for sampling outside air, a computerized automatic control, and a data acquisition system. Air constituents and related flight data are tape recorded in flight for later computer processing on the ground. Author

N75-31620*# Florida Inst. of Tech., Melbourne. Dept. of Physics and Space Sciences.

CORRELATION OF THE EARTH'S ROTATION RATE AND THE SECULAR CHANGE OF THE GEOMAGNETIC FIELD Final Technical Report, 1 Dec. 1974 - 31 Aug. 1975

Rong-sheng Jin 31 Aug. 1975 18 p refs

(Grant NsG-5038)

(NASA-CR-143623) Avail: NTIS HC $3.25 CSCL 08N

Power spectral density analysis using Burg's maximum entropy method was applied to the geomagnetic dipole field and its rate of change for the years 1901 to 1969. Both spectra indicate relative maxima at 0.015 cycles/year and its harmonics. These maxima correspond approximately to 66, 33, 22, 17, 13, 11, and 9-year spectral lines. The application of the same analysis techniques to the length-of-day (l.o.d) fluctuations for the period 1865 to 1961 reveal similar spectral characteristics. Although peaks were observed at higher harmonics of the fundamental frequency, the 22-year and 11-year lines are not attributed unambiguously to the solar magnetic cycle and the solar cycle. It is suggested that the similarity in the l.o.d fluctuations and the dipole field variations is related to the motion within the earth's fluid core during the past one hundred years. Author

N75-31621*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

VERTICAL TEMPERATURE AND DENSITY PATTERNS IN THE ARCTIC MESOSPHERE ANALYZED AS GRAVITY WAVES

I. J. Eberstein and J. S. Theon Mar. 1975 47 p refs Submitted for publication

(NASA-TM-X-70962; X-911-75-69) Avail: NTIS HC $3.75 CSCL 04A

Rocket soundings conducted from high latitude sites in the Arctic mesosphere are described. Temperature and wind profiles and one density profile were observed independently to obtain the thermodynamic structure, the wind structure, and their interdependence in the mesosphere. Temperature profiles from all soundings were averaged, and a smooth curve (or series of smooth curves) drawn through the points. A hydrostatic atmosphere based on the average, measured temperature profile was computed, and deviations from the mean atmosphere were analyzed in terms of gravity wave theory. The vertical wavelengths of the deviations were 10-20 km, and the wave amplitudes slowly increased with height. The experimental data were matched by calculated gravity waves having a period of 15-20 minutes and a horizontal wavelength of 60-80 km. The wind measurements are consistent with the thermodynamic measurements. The results also suggest that gravity waves travel from East to West with a horizontal phase velocity of approximately 60 m sec-1. Author

N75-31622*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ON THE MAGNON INTERACTION IN HAEMATITE. 2: MAGNON ENERGY OF THE ACOUSTICAL MODE AND MAGNETIC CRITICAL FIELDS

N. L. Bonavito, O. Nagai (Kobe Univ.), and T. Tanaka (Catholic Univ. of America) Aug. 1975 23 p refs Submitted for publication

(NASA-TM-X-70971; X-932-75-207) Avail: NTIS HC $3.25 CSCL 08G

Previous spin wave theories of the antiferromagnet hematite were extended. The behavior of thermodynamic quantities around the Morin transition temperature was studied, and the latent heat of the Morin transition was calculated. The temperature dependence of the antiferromagnetic resonance frequency and the parallel and perpendicular critical spin-flop magnetic fields were calculated. It was found that the theory agrees well with experiment. Author

N75-31623# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Jan. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, JANVIER 1974]
Jan. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, atmospheric electricity, and cosmic rays during January 1974 are presented. ESRO

N75-31624# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Feb. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, FEVRIER 1974]
Feb. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, atmospheric electricity, and cosmic rays during February 1974 are presented. ESRO

N75-31625# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Mar. 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, MARS 1974]
Mar. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for March 1974. ESRO

N75-31626# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Apr. 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, AVRIL 1974]
Apr. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for April 1974. ESRO

N75-31627# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, May 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, MAI 1974]
May 1974 31 p In FRENCH and DUTCH
HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for May 1974. ESRO

N75-31628# Kiruna Geophysical Observatory (Sweden).
KIRUNA GEOPHYSICAL DATA Data Summary, Apr. - Jun. 1974
G. Gustafsson, ed. Jun. 1974 64 p
(Rept-74/4-6) Avail: NTIS HC $4.25

Geomagnetic K-indices, ionospheric absorption tables, normal magnetograms and vertical riometer data are presented for the period April to June 1974, together with the diagrams for the mean diurnal variation of cosmic noise absorption. ESRO

N75-31629# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Jun. 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, JUIN 1974]
Jun. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for June 1974. ESRO

N75-31630# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Mar. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, MARS 1974]
Mar. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, atmospheric electricity, and cosmic rays during March 1974 are presented. ESRO

N75-31631# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Apr. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, AVRIL 1974]
Apr. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, atmospheric electricity, and cosmic rays during April 1974 are presented. ESRO

N75-31632# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, May 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, MAI 1974]
May 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, atmospheric electricity, and cosmic rays during May 1974 are presented. ESRO

N75-31633# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Oct. 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, OCTOBRE 1974]
Oct. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for October 1974. ESRO

N75-31634# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Nov. 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, NOVEMBRE 1974]
Nov. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for November 1974. ESRO

N75-31635# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Sep. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, SEPTEMBRE 1974]
Sep. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, atmospheric electricity, and cosmic rays during September 1974 are presented. ESRO

N75-31636# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Oct. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, OCTOBRE 1974]
Oct. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, atmospheric electricity, and cosmic rays during October 1974 are presented. ESRO

N75-31637# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Nov. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN

MENSUEL, NOVEMBRE 1974]
Nov. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, atmospheric electricity, and cosmic rays during November 1974 are presented. ESRO

N75-31638# Institut Royal Meteorologique de Belgique, Brussels.
OZONE OBSERVATIONS Quarterly Report, 1971 [OBSERVATIONS D'OZONE 3EME TRIMESTRE 1971]
1974 38 p refs In FRENCH and DUTCH
(QR-3) Avail: NTIS HC $3.75

Spectrophotometric ozone measurements are reported for the third quarter of 1971. The presented ozonograms contain designations for partial ozone pressure and atmospheric diffusion, air temperature, and used wavelengths. ESRO

N75-31639# Teledyne Geotechnical, Alexandria, Va.
OPERATION OF THE TONTO FOREST SEISMOLOGICAL OBSERVATORY Quarterly Report, 1 Oct. - 31 Dec. 1974
7 Feb. 1975 28 p
(Contract F08606-74-C-0007)
(AD-A009826; TR-75-1; QR-5) Avail: NTIS CSCL 17/10

The resport discusses the work accomplished on Project VT/4704 from 1 October through 31 December 1974. It describes the operation, evaluation, and improvement of the Tonto Forest Seismological Observatory (TFSO), located near Payson, Arizona, the research and test functions carried out at the TFSO, and the research tasks performed by the Geotech staff in Garland, Texas, using TFSO data. GRA

N75-31640# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.
AVERAGE P AND PKP CODAS FOR EARTHQUAKES (103 DEGREES-118 DEGREES)
E. I. Sweetser and T. J. Cohen 10 Jun. 1974 46 p refs
(Contract F08606-74-C-0006; ARPA Order 1620)
(AD-A009890; SDAC-TR-73-10) Avail: NTIS CSCL 17/10

An analysis of seismograms of scores of large and small events, recorded at a world-wide network of stations is presented. Coda decay characteristics are described. Large events are shown to be multiple events (retarded coda characteristics) with the period of source activity estimated to be two minutes. Average coda decay curves are shown for various distances.
Author (GRA)

N75-31641# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.
SIGNAL ENHANCEMENT OF LPE DATA
Duane D. Nelson and David H. VonSeggern 27 Aug. 1973 48 p refs
(Contract F08606-74-C-0006; ARPA Order 1620)
(AD-A009335; SDAC-TR-73-4) Avail: NTIS CSCL 17/10

In this report the authors investigate signal/noise ratio enhancement obtainable on single-station LPE recordings by several techniques. The processors which are compared over a data base of 20 events include simple band-pass filtering, match filtering with a synthetic LR signature, and time-varying non-linear processing which examines three-component data for Rayleigh-wave characteristics. For the suite of events in this study, average S/N ratio improvement is 6 db for match filtering, 15 db for the non-linear PHILTRE processor and 20 db cascading the two processors. GRA

N75-31642# General Electric Co., Santa Barbara, Calif. DASIAC.
REACTION RATE DATA: NUMBER 50 Annual Research Report, 1 Jul. 1973 - 30 Jun. 1974
Dec. 1974 24 p refs
(Contract DNA001-74-C-0014)
(AD-A009332; ARR-8) Avail: NTIS CSCL 04/1

Summaries of research on atmospheric chemistry and physics are presented Reaction kinetics, atomic and molecular physical processes, thermochemistry related to the upper atmosphere are included. GRA

N75-31643# General Electric Co., Santa Barbara, Calif. DASIAC.
REACTION RATE DATA: NUMBER 49; RESUME OF FY 75, DNA-SPONSORED CHEMISTRY/PHYSICS REACTION RATE RESEARCH PROGRAMS
Oct. 1974 15 p
(Contract DNA001-74-C-0014)
(AD-A009330) Avail: NTIS CSCL 04/1

Research in the areas of atmospheric chemistry and physics is summarized. Topics include reaction rates and kinetics, nuclear fireball related phenomena, infrared properties, and ionization processes. GRA

N75-31644# Alaska Univ., College. Geophysical Inst.
SEISMOLOGICAL RESEARCH IN CENTRAL ALASKA Final Report, 1 Apr. 1973 - 31 Dec. 1974
N. N. Biswas, B. Bhattacharya, J. D. VanWormer, J. Davies, and L. Gedney Dec. 1974 85 p refs
(Contract F44620-73-C-0053; ARPA Order 1827)
(AD-A009161; AFOSR-75-0600TR) Avail: NTIS CSCL 08/11

Contents: Travel time relations for the crust and upper mantle P-wave phases for central Alaskan data; seismicity and plate tectonics in South-central Alaska; earthquake source mechanics for small magnitude earthquakes in central Alaska; study of Ms-m sub b relations from central Alaska data. GRA

N75-31645# National Science Foundation, Washington, D.C.
RADIATION CLIMATE AND MEASUREMENTS
1975 67 p refs Transl. into ENGLISH from Mono. Dokl. Vsesoyuznoi Konf. po Ispolvzovaniyu Solnetsnoi Energii, Erevan (Moscow), 17-21 Jun. 1969
(TT-74-58068) Avail: NTIS HC $4.25 CSCL 04A

Presented are papers dealing with determination of solar radiation on the earth's surface, solar radiation effects on aging of materials, natural ultraviolet radiation in houses, standardization of the distribution of the luminance of the clear sky, and a portable monochromator for spectral measurements of the natural ultraviolet radiation. GRA

N75-31646# Army Electronics Command, Fort Monmouth, N.J.
ATMOSPHERIC EFFECTS FOR GROUND TARGET SIGNATURE MODELING. 3: DISCUSSION AND APPLICATION OF THE ASL SCATTERING MODEL
Richard B. Gomez, Carmine Petracca, Charles Querfeld, and Glenn B. Hoidale Mar. 1975 40 p refs
(DA Proj. 1T1-61102-B-53A)
(AD-A009722; ECOM-5558) Avail: NTIS CSCL 04/1

The aim of the atmospheric modeling project is to predict absorption and scattering effects of the atmospheric medium on the transmission of ground target electromagnetic (EM) signatures in the spectral region 0.4-14 micrometers, for a wide range of meteorological conditions. Special attention is being given to low visibility atmospheric states which can exist under battlefield conditions. Two important related aspects of the program are the atmospheric extinction and radiative transfer models. These models will be integrated into system performance models for the evaluation of terminal homing, surveillance, and target acquisition systems. This report will describe the Atmospheric Sciences Laboratory's (ASL) single scattering model, which was developed for input to multiple scattering codes for the determination of EM extinction caused by the atmospheric aerosol. Sample applications will be made to the cases of haze and dust. GRA

N75-31647# Chicago Univ., Ill.
A DISCRETE MODEL OF THE INVERSE LOVE WAVE PROBLEM
Victor Barcilon May 1975 40 p refs
(Contract N00014-67-A-0285-0021; NR Proj. 041-476)
(AD-A009437; TR-2) Avail: NTIS CSCL 08/11

The vibrating system which consists of horizontal elastic ribs of uniform linear densities (m sub 1), (m sub 2), ..., (m sub N) connected by massless strips of widths (l sub 1), (l sub 2), ..., (l sub N) is used as a discrete mathematical model of the Love wave problem. Given either the asymptotic behavior of all the dispersion curves or the knowledge of a single dispersion curve, the general question of the uniqueness of the solution of the inverse problem is considered. Partial results in that

direction strengthen the conjecture that the structure of the vibrating system can be inferred uniquely from the data. GRA

N75-31648# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ISUA, GREENLAND: GLACIER FREEZING STUDY
George D. Ashton Apr. 1975 28 p refs
(AD-A009705; CRREL-RR-334) Avail: NTIS CSCL 08/12

A scheme for cooling the lower portion of the edge of the Greenland ice sheet, which abuts a potential mining operation, is examined. The magnitude of cooling which may be accomplished by drilling a series of holes about the periphery of the mine site is determined as a function of hole size, spacing and time. Refrigeration is accomplished by pumping a coolant downhole in a central pipe, then uphole in an annulus between the pipe and hole wall, and then through a thin-walled pipe exposed to the surface climate above the ice sheet. It was found possible to achieve a temperature change in the ice of the order of --1C with hole spacings and pumping requirements which are considered reasonable. Other effects are briefly examined and include an estimate of the basal water thickness and flow rates. GRA

N75-31649# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AN EVALUATION OF AAPS ACCEPTANCE PERFORMANCE
Mahlon S. Hunt 3 Feb. 1975 35 p refs
(AF Proj. 7600)
(AD-A009632; AFCRL-TR-75-0068; AFCRL-IP-226) Avail: NTIS CSCL 08/5

Two prototype Automated Astronomic Positioning Systems (AAPS) were developed. The purpose of these prototypes is to demonstrate a relatively fast field technique for determining accurate astronomic position. This report provides a summary of AAPS performance as interpreted from evaluation data resulting from the AFCRL development contract. GRA

N75-31650# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
THE BEARING CAPACITY OF FLOATING ICE PLATES SUBJECTED TO STATIC OR QUASISTATIC LOADS, A CRITICAL SURVEY
Arnold D. Kerr Mar. 1975 46 p refs
(Contract DACA70-C-0022; ARPA Order 1615)
(AD-A009363; CRREL-RR-333) Avail: NTIS CSCL 08/12

This report contains a critical survey of the literature on the bearing capacity of floating ice plates. It consists of a discussion of general questions, a critical survey of analytical attempts to determine the bearing capacity of floating ice plates, and a survey of field and laboratory tests on floating ice plates and their relation to the analytical results. The paper concludes with a systematic summary of the results, a discussion of observed shortcomings, and suggestions for needed investigations. GRA

N75-31651# Informatics, Inc., Rockville, Md.
RECENT SOVIET DEVELOPMENTS IN SEISMOLOGY
M. Ness 8 May 1975 74 p refs
(Contract N00600-75-C-0018; DARPA Order 2790)
(AD-A009817) Avail: NTIS CSCL 08/11

The present compilation of abstracts contains recent information on seismometry, computer seismology, explosion seismology, and general information on seismology, including some material on the Rumanian seismological stations and several articles on seismological research in Communist China. GRA

N75-31652# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
SEISMIC FIELD METHODS FOR IN SITU MODULI Final Report
Robert F. Ballard, Jr. and Francis G. McLean Apr. 1975 44 p refs
(AD-A009488; AEWES-Misc-Paper-S-75-10) Avail: NTIS CSCL 13/2

The design and evaluation of the response of engineered structures to earthquake excitation have increased the current use of seismic field studies to determine soil properties at low strain levels for in situ materials. Buildings, nuclear power plants, major earth structures, locks, and concrete dams are now being studied using finite element techniques and modal or time-step analyses. The validity of these studies and the interpretation of their results depend on a reliable assessment of input values for in situ foundation properties. This report presents procedures for planning seismic field investigations for the determination of soil properties. Emphasis is placed on the selection of appropriate seismic techniques to obtain sufficient redundant data with which to establish internal consistency for reliable assessments of determined properties. GRA

N75-31653# Ohio State Univ. Research Foundation, Columbus. Dept. of Physics.
THE EFFECTS OF REFRACTION AND DISPERSION ON HIGH-ALTITUDE MEASUREMENTS OF ATMOSPHERIC GASES. 2: CALCULATIONS WITH THE VOIGHT LINE SHAPE Final Report
James K. G. Watson and Peter K. L. Yin Jan. 1975 118 p refs
(Grant NOAA-NG-28-72)
(COM-75-10595/7; NOAA-75041412) Avail: NTIS HC $5.25 CSCL 04A

A general study of the effects of refraction and dispersion in the solar occultation absorption technique is described, based on the Voigt profile for the shapes of individual spectral lines. New numerical techniques are developed to evaluate both the absorption and the dispersion of the Voigt profile. These techniques are then applied to calculations of the angular deviation and atmospheric absorption, taking into account the curvature of the path and the effect of anomalous dispersion. The possibility of atmospheric temperature sounding by means of the occultation absorption technique is discussed, and sensitivity tests are performed. Computer programs for these calculations are included. GRA

N75-31654# Alaska Univ., College. Geophysical Inst.
RELATIONSHIP BETWEEN CIRCUMSOLAR SKY BRIGHTNESS AND ATMOSPHERIC AEROSOLS Final Report, Sep. 1972 - Jun. 1974
Gleen F. Shaw and Charles S. Deehr Jun. 1974 115 p refs
(Grant EPA-R-801113)
(PB-241806/9; EPA-650/4-75-012) Avail: NTIS HC $5.25 CSCL 04A

Measurements of the sky intensity in the solar vertical plane and in the solar almucantar were taken at an arctic location near Barrow, Alaska, a sub-arctic location at Ester Dome, Alaska, and a tropical station at Loiyengalani, Kenya. The data were used to obtain the aerosol scattering phase function for various synoptic conditions and air-mass types. The scattering phase functions were compared to calculated phase functions obtained by assuming various forms of the aerosol size distribution function. Numerical estimates were made of the columnar aerosol mass loading. Typical of continental observations, a Junge power-law aerosol size distribution approximates the observed scattering phase function rather well. The observations indicate that the Junge power-law exponent depends upon air mass type and to a lesser extent on local climatological conditions. Author (GRA)

N75-31655# California Univ., Berkeley. Seismographic Station.
TERRESTRIAL FINE STRUCTURE AND CALIFORNIA TECTONICS USING A NEW REGIONAL HIGH GAIN OBSERVATORY Final Report
Bruce A. Bolt 10 Jan. 1975 7 p
(Grant NOAA-04-3-022-15)
(COM-75-10575/9) Avail: NTIS HC $3.25 CSCL 08K

The installation of seismographic instrumentation in a disused tunnel near Whiskeytown Dam, northwest of Redding, California is discussed. The seismometer is providing four channels of data telemetered to Berkeley for continuous recording. Two broadband velocity outputs along with two displacement signals record on magnetic tape. The installation is one of three broadband stations of the University of California in Northern California. GRA

N75-31656# Dugway Proving Ground, Utah.
APPLICATION OF THE CALDER FINITE DIFFERENCE DIFFUSION MODEL TO CALCULATIONS OF INSTANTANEOUS ELEVATED LINE SOURCE DOSAGES Final Report

Albert W. Waldron, Jr. Apr. 1975 61 p refs
(AD-A009750; DPG-FR-M921A) Avail: NTIS CSCL 04/1

This paper compares calculations of vertical and surface dosage distributions, obtained from a finite difference numerical solution of the classical line source diffusion equation, to calculations obtained from an analytical solution and to observed distributions obtained from several line source releases. The analytical solution uses constant values of vertical turbulence and wind speed averaged with height. This solution then approximates the effects on surface dosages of increasing stability aloft by using reflection from the top of the mixing layer. The finite difference numerical solutions considers the change of eddy diffusivity and wind speed with height in such a way as to produce vertical dosage profile closer to the observed. Turbulence values for use in the numerical model are obtained from calculations of vertical diffusivity based on statistical theory. The numerical solution predicts the vertical dosage profile more accurately than the analytical solution. Both solutions predict surface dosages equally well. Verification of the numerical solution on other data appears desirable. GRA

N75-31657# Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). Div. of Cloud Physics.
ATMOSPHERIC PARTICULATES Annual Report, Apr. 1975
Keith Bigg 29 Apr. 1975 13 p
(Contract N00014-75-C-0712; RR0330301)
(AD-A009481) Avail: NTIS CSCL 04/1

The report gives a general analysis of stratospheric particles over Australia during 1969 and 1970, as determined by viewing particle impact screens (exposed during stratospheric balloon flights) with the electron microscope. GRA

N75-31658# Geological Survey, Menlo Park, Calif.
PRINCIPAL FACTS, ACCURACIES, SOURCES, BASE STATION DESCRIPTIONS, AND PLOTS FOR 1,931 GRAVITY STATIONS ON THE MARIPOSA AND PART OF THE GOLDFIELD 1 DEGREE X 2 DEGREES QUADRANGLES, CALIFORNIA AND NEVADA Final Report
S. L. Robbins, H. W. Oliver, and D. F. Huber 1975 85 p refs
(PB-241469/6; USGS/GD-75/008) Avail: NTIS HC $4.75 CSCL 08E

Principal facts for 1,931 gravity stations on the Mariposa and part of the Goldfield 1 degree x 2 degrees quadrangles California and Nevada are given in 9 separate tables. Also included in the report is a brief summary of the format used, station name and location plots at a scale of 1:250,000, and descriptions for 21 base stations. All of the gravity stations were reduced to complete Bouguer anomalies. A discussion of individual data sets is provided and includes information pertaining to data sources, gravity meters used, base stations used, reduction problems and overall accuracies of the data. GRA

N75-31659# Ohio State Univ., Columbus. Dept. of Geodetic Science.
PRECISE GRAVIMETRIC GEODESY Interim Report
Helmut Moritz Dec. 1974 80 p refs
(Contract F19628-72-C-0120)
(AD-A009628; DGS-219; SR-21; AFCRL-TR-74-0640) Avail: NTIS CSCL 08/5

The report discusses the refinement of computational formulas and the gravity data necessary to obtain geoidal heights to plus or minus 10 cm accuracy. Methods of taking into account the effects of the atmosphere, of the topography, and of the ellipticity of the reference surface are given. Emphasis is on appropriate refinements of Stokes: formula, using gravity anomalies, and of least-squares collocation, using data of different types. The determination of the sea surface topography from gravity disturbances is also investigated. Finally, requirements on absolute and relative gravity data and on their distribution are outlined. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-31660 Purdue Univ., Lafayette, Ind.
A MODEL OF HORIZONTAL EDDY-DISSIPATION OF KINETIC ENERGY AND ITS APPLICATION DURING THE LIFE CYCLE OF AN INTENSE CYCLONE Ph.D. Thesis
Sharad Prasad Adhikary 1974 79 p
Avail: Univ. Microfilms Order No. 75-17144

Atmospheric flow possesses a two-dimensional feature characterized by both grid and subgrid-scale quasi-horizontal eddies. A parameterization scheme is developed to study the dissipation of kinetic energy attributed to energy exchanges between these larger and smaller scale circulations. The dissipation due to horizontal eddy exchanges is computed utilizing routinely available rawinsonde information. Computations were carried out for a period spanning the life cycle of an intense mid-latitude cyclone. The results reflect the influence of winds and wind shears with maxima in the upper troposphere and are qualitatively comparable with the enstrophy dissipation as predicted by two-dimensional turbulence theories. In addition, the contribution of horizontal eddy-dissipation to the total dissipation is maximized when large-scale barotropic processes dominate baroclinic processes. Dissert. Abstr.

N75-31661 Purdue Univ., Lafayette, Ind.
AN INVESTIGATION OF WAVE FEATURES IN SQUALL LINES AND THEIR RELATIONSHIP TO SEVERE WEATHER PRODUCTION Ph.D. Thesis
Thomas Albert Schroeder 1974 313 p
Avail: Univ. Microfilms Order No. 75-17279

Wave phenomena associated with severe weather events were examined. Radar data, satellite imagery, synoptic scale data, and subsynoptic scale data were analyzed. A physical model of wave formation was developed. A line-echo-wave-pattern (LEWP) was observed from radar, while a second wave produced by momentum transport downward in the vicinity of a local wind maximum was seen from satellite imagery. An arguement for tornado formation by a severe thunderstorm is proposed. The proposed mechanism is found to relate the intensity of the updraft of the thunderstorm as a vorticity source with the gust front or outflow boundary as a source of creation of a vortex sheet. The roll up of this vortex sheet then produces the tornado circulation which feeds upon the vorticity source is the updraft. Tornado maintenance then is a function of outflow motion versus total storm motion. Dissert. Abstr.

N75-31662*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
DEVELOPMENT OF A STRATOSPHERIC AND MESOSPHERIC MICROWAVE TEMPERATURE SOUNDER EXPERIMENT Final Report, 25 Jun. 1971 - 30 Jun. 1975
D. H. Staelin, P. W. Rosenkranz, B. G. Anderson, K. F. Kunzi, R. M. Paroskie, R. J. Parr, and J. W. Waters 30 Jun. 1975 70 p refs
(Contract NAS1-10693)
(NASA-CR-132719) Avail: NTIS HC $4.25 CSCL 04B

A passive microwave spectrometer system for measuring global atmospheric temperature profiles from 0-75 km altitude was developed and analyzed. The system utilizes 12 channels near the 5 mm wavelength oxygen absorption band and is designed to provide global coverage by scanning perpendicular to the orbital track of a polar orbiting satellite. A significant improvement in the accuracy of theoretical atmospheric microwave transmittance functions was achieved through the development of a first-order approximation to overlapping line theory for the oxygen molecule. This approximation is particularly important in the troposphere and lower stratosphere where pressure-broadening blends nearby lines. Ground-based and aircraft observations of several resonances of stratospheric oxygen generally support the theory. The 23, 25, 29, and 31 atmospheric oxygen lines were measured and the frequencies of several such oxygen lines were measured with improved precision. The polarization and Zeeman splitting of the atmospheric 27 line was also observed. Author

N75-31663*# Colorado State Univ., Fort Collins. Fluid Dynamics and Diffusion Lab.
AN INVESTIGATION OF TURBULENT TRANSPORT IN THE EXTREME LOWER ATMOSPHERE
Chester A. Koper, Jr. and Willy Z. Sadeh Washington NASA Aug. 1975 240 p refs
(Contract NAS8-28590)
(NASA-CR-2567) Avail: NTIS HC $7.50 CSCL 04A

A model in which the Lagrangian autocorrelation is expressed by a domain integral over a set of usual Eulerian autocorrelations acquired concurrently at all points within a turbulence box is proposed along with a method for ascertaining the statistical stationarity of turbulent velocity by creating an equivalent ensemble to investigate the flow in the extreme lower atmosphere. Simultaneous measurements of turbulent velocity on a turbulence line along the wake axis were carried out utilizing a longitudinal array of five hot-wire anemometers remotely operated. The stationarity test revealed that the turbulent velocity is approximated as a realization of a weakly self-stationary random process. Based on the Lagrangian autocorrelation it is found that: (1) large diffusion time predominated; (2) ratios of Lagrangian to Eulerian time and spatial scales were smaller than unity; and, (3) short and long diffusion time scales and diffusion spatial scales were constrained within their Eulerian counterparts.
Author

N75-31664*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERACTIVE IMAGE PROCESSING FOR METEOROLOGICAL APPLICATIONS AT NASA/GODDARD SPACE FLIGHT CENTER
James B. Billingsley and A. Frederick Hasler Apr. 1975 14 p Presented at the Machine Processing of Remotely Sensed Data Conf., Lafayette, Ind., 3-5 Jun. 1975
(NASA-TM-X-70964; X-933-75-97) Avail: NTIS HC $3.25 CSCL 04B

The development of interactive image processing techniques which have led to meteorological data processing systems are discussed. Hardware and software functions of the existing Image Display and Manipulation System (IDAMS) and the special-purpose METPAK software package which has been developed for performing meteorology operations on IDAMS are described. A second-generation interactive image processing system, the Atmospheric and Oceanographic Information Processing System (AOIPS), which is under development, is also outlined. These systems are being designed to provide the necessary high throughput required for analysis of geostationary satellite data in the time domain.
Author

N75-31665# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Jun. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, JUIN 1973]
Jun. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in June 1973 are given.
ESRO

N75-31666# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Jul. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, JUILLET 1973]
Jul. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in July 1973 are given.
ESRO

N75-31667# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Aug. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, AOUT 1973]
Aug. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in August 1973 are given.
ESRO

N75-31668# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Sep. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, SEPTEMBRE 1973]
Sep. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in September 1973 are given.
ESRO

N75-31669# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Oct. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, OCTOBRE 1973]
Oct. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in October 1973 are given.
ESRO

N75-31670# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, May 1974 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, MAI 1974]
May 1974 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during May 1974 are given.
ESRO

N75-31671# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Jul. 1974 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, JUILLET 1974]
Jul. 1974 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during May 1974 are given.
ESRO

N75-31672# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Sep. 1974 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, SEPTEMBRE 1974]
Sep. 1974 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during September 1974 are given.
ESRO

N75-31673# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Oct. 1974 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, OCTOBRE 1974]
Oct. 1974 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during October 1974 are given.
ESRO

N75-31674# World Meteorological Organization, Geneva (Switzerland).
REVIEW OF URBAN CLIMATOLOGY, 1968 - 1973
T. R. Oke (British Columbia Univ.) 1974 53 p refs Presented at the 6th session of the WMO Comm. for Spec. Appl. of Meteorology and Climatology, Bad Homburg, West Ger., 8-19 Oct. 1973
(WMO-383; TN-134; ISBN-92-63-10383-6) Avail: NTIS HC $4.25

Work concerning the nature of the fundamental flows of energy and water in the city-atmosphere system is reviewed. Among the aspects covered are short and long wave radiation, considering both the atmospheric and surface effects; moisture releases by combustion; and the nature of urban precipitation and evaporation. The impact of urbanization on such meteorological parameters as air temperature, humidity, and wind speed is discussed. Attempts to model the workings of urban climates using physico-mathematical techniques are described and the similarities and differences among models are reviewed in terms of the objectives of the models and the assumptions and techniques used in their formulation.
ESRO

N75-31675# Fondazione Ugo Bordoni, Rome (Italy).
MEASUREMENTS OF THE PRECIPITATION INTENSITY WITHIN THE RESEARCH PROGRAM ON RADIOWAVE PROPAGATION AT FREQUENCIES HIGHER THAN 10 GHz

[MISURE DI INTENSITA DI PRECIPITAZIONE NELL' AMBITO DEL PROGRAMMA DI RICERCA SULLA RADIO-PROPAGAZIONE A FREQUENZE SUPERIORI A 10 GHz]
F. Fedi, U. Merlo, and B. Peroni 28 Sep. 1974 59 p refs In ITALIAN
Avail: NTIS HC $4.25

Performance tests on rain gages of the capacitance or collector type are presented. The rain gages are described with the calibration method and data acquisition chain. The errors and data dispersion of artificial rain intensity are discussed. Behavior under variable excitations is detailed. The results are synthetized with a view to application to the study of atmospheric attenuation at 10 GHz. ESRO

N75-31676# World Meteorological Organization, Geneva (Switzerland).
CLIMATOLOGICAL ASPECTS OF THE COMPOSITION AND POLLUTION OF THE ATMOSPHERE
G. C. Holzworth 1974 54 p refs
(WMO-393; TN-139; ISBN-92-63-10393) Avail: NTIS HC $4.25

Some practical guidelines on the processing and use of regular surface and upper air observations in terms of their climatological influence on transport and diffusion of air pollutants are presented. The concept of a meteorological potential for air pollution is discussed. An attempt was made to include examples of pertinent climatological data for various parts of the world but in fact the data are limited to temperate and northern latitudes of the Northern Hemisphere. There is a paucity of available meteorological studies relative to air pollution in the tropics, which, unfortunately, is where industrialization, energy consumption, and pollutant emissions are expected to increase rapidly. In addition to transport and diffusion, some attention is also devoted to climatological influences on the transformation of pollutants while they are airborne, especially the photochemical formation of oxidant. A summary is given of pertinent in-house publications.
Author (ESRO)

N75-31677# World Meteorological Organization, Geneva (Switzerland).
WORLD WEATHER WATCH: CONSOLIDATED REPORT ON THE VOLUNTARY ASSISTANCE PROGRAMME INCLUDING PROJECTS APPROVED FOR CIRCULATION IN 1974
Jan. 1975 267 p
(WMO-404; ISBN-92-63-10404-2) Avail: NTIS HC $8.50

General remarks on the overall situation of the voluntary assistance program (VAP) as of 31 December 1974 are given, together with the current set of guidelines approved for use in the implementation of World Weather Watch projects through the VAP. Information on the contributions (equipment and services) received for the implementation of VAP projects, the status of implementation, and the individual projects approved for circulation in 1974 is given. ESRO

N75-31678# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Mar. 1974 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, MARS 1974]
Mar. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in March 1974 are given. ESRO

N75-31679# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Apr. 1974 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, AVRIL 1974]
Apr. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in April 1974 are given. ESRO

N75-31680# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, May 1974 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, MAI 1974]
May 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in May 1974 are given. ESRO

N75-31681# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Feb. 1975 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, FEVRIER 1975]
Feb. 1975 16 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during February 1975 are given. ESRO

N75-31682# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Mar. 1975 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, MARS 1975]
Mar. 1975 16 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during March 1975 are given. ESRO

N75-31683# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Apr. 1975 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, AVRIL 1975]
Apr. 1975 16 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during April 1975 are given. ESRO

N75-31684# Cramer (H.E.) Co., Inc., Salt Lake City, Utah.
APPLICATION OF METEOROLOGICAL PREDICTION MODELS FOR FOREST SPRAY PROBLEMS
R. K. Dumbauld, H. E. Cramer, and J. W. Barry Mar. 1975 44 p refs
(Contract DAAD09-74-C-0005)
(AD-A009840; DPG-TN-M935p; TECOM-5-CO-403-000-051)
Avail: NTIS CSCL 02/6

The report discusses the use of meteorological prediction models in planning and conducting aerial spray operations involving insecticides. The presentation includes a discussion of model inputs and calculations for the 1974 Idaho Tussock Moth test for determining spray droplet-size distribution and spray deposition and concentration at the forest canopy. GRA

N75-31685# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS: INDONESIAN COASTAL MARINE AREAS. VOLUME 3: AREA 15, BALI SEA; AREA 16, FLORES SEA; AREA 7, NORTHWEST FLORES SEA; AREA 18, SOUTH MAKASSAR STRAIT; AREA 19, CENTRAL MAKASSAR STRAIT; AREA 20, NORTH MAKASSAR STRAIT; AREA 21, SOUTHWEST CELEBES SEA
Apr. 1975 566 p
(AD-A009275) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSD Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N75-31686# Naval Postgraduate School, Monterey, Calif.
AN ATMOSPHERIC GLOBAL PREDICTION MODEL USING A MODIFIED ARAKAWA DIFFERENCING SCHEME Technical Report, Jul. 1974 - Mar. 1975
A. V. Monaco and R. T. Williams Apr. 1975 79 p refs
(AD-A009121; NPS-51WU75041) Avail: NTIS CSCL 04/2

A modified version of the new Arakawa differencing scheme for atmospheric global circulation was programmed for a two-level, adiabatic and frictionless model. In all cases analytic initial data were used to simplify evaluation. Experiments were designed to test various terms of the primitive equations as well as over-all performance. The 48-hour forecasts were well-behaved and showed goo phase propagation. GRA

N75-31687# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS: NORTH AMERICAN COASTAL MARINE AREAS, REVISED. ATLANTIC AND GULF COASTS. VOLUME 2, AREA 8: ST. LAWRENCE RIVER, AREA 9: GULF OF ST. LAWRENCE, AREA 10: CAPE BRETON ISLAND S. E., AREA 11: HALIFAX, AREA 12: BOSTON, AREA 13: QUONSET POINT, AREA 14: NEW YORK
May 1975 566 p
(AD-A008666) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family II (TDF - 11), Marine Surface observations. TDF - 11 was primarily funded by the Naval Weather Service Command and selected by NWSD Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N75-31688# National Marine Fisheries Service, La Jolla, Calif.
HEAT EXCHANGE BETWEEN OCEAN AND ATMOSPHERE IN THE EASTERN NORTH PACIFIC FOR 1961-1971
N. E. Clark, L. Eber, R. M. Laurs, J. A. Renner, and J. F. T. Saur Dec. 1974 112 p
(COM-75-10661/7; NOAA-TR-NMFS-SSRF-682; NOAA-75042204) Avail: NTIS MF $2.25; SOD HC as C55.13:NMFS-SSRF-682 CSCL 04B

Summaries of large scale heat exchange between ocean and atmosphere in the eastern North Pacific Ocean are presented for the period 1961 through 1971. The summaries are based on computations made from synoptic marine radio weather reports and include (1) monthly values of total heat exchange and departures from a long term mean, (2) long term monthly mean values of the total heat exchange, incoming solar radiation, effective back radiation, and evaporative and sensible heat transfer, and (3) annual cycles of total heat exchange for selected areas. Outstanding spatial and temporal features of the heat exchange values are discussed. GRA

N75-31689# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
DROPSONDE WIND MEASUREMENTS USING OMEGA/LORAN TRACKING
James F. Morrissey and Bernard D. Weiss 19 Feb. 1975 33 p refs
(AF Proj. 6670; AF Proj. 6679)
(AD-A009634; AFCRL-TR-75-0096; AFCRL-IP-228) Avail: NTIS CSCL 04/2

In April 1974, a series of aircraft tests was performed to evaluate the usefulness of retransmitted navigational aid signals (NAVAIDS) for measuring winds beneath flight level. Specifically, the OMEGA and LORAN signals were the NAVAID signals investigated. The use of LORAN signals was found to provide better than 1 mps accuracy when 2 min of data were used in the computation. For the OMEGA signals, the accuracy was found to be 1-1/2 mps for a 3-min data interval. In these tests, the 2- and 3-min intervals represent approximately 2000 and 3000 ft intervals of altitude due to motion of sounding instrument. GRA

N75-31690# Chicago Univ., Ill. Lab. for Atmospheric Probing.
MOTION FIELD CHARACTERISTICS OF THE EVAPORATIVE BASE REGION OF A STRATIFORM PRECIPITATION LAYER AS DETERMINED BY ANDASCE Final Report
F. Ian Harris Jan. 1975 7 p refs Prepared in cooperation with Ill. Inst. of Tech.
(Grant NOAA-04-4-022-4)
(COM-75-10531/2; NOAA-75041603) Avail: NTIS HC $3.25 CSCL 04B

In relatively homogeneous widespread precipitation, a single Doppler radar performing a Doppler azimuth scan at constant elevation (DASCE) may be used to determine many characteristics of the velocity field. Methods of deducing the vector horizontal wind and its divergence and deformation were developed. It was suggested that the turbulent momentum transfers on scales between the dimensions of the pulse volume and the ASCE (azimuth scan at constant elevation) circle may be deduced from the DASCE measurements. These methods are briefly reviewed and new methods for deducing large scale organized motions and characteristic of turbulence on scales smaller than the dimensions of the pulse volume are developed. GRA

N75-31691# National Environmental Satellite Service, Coral Gables, Fla. Satellite Field Services Station.
ATLANTIC TROPICAL CYCLONE CLASSIFICATIONS FOR 1974
Donald C. Gaby, Donald R. Cochran, James B. Lushine, Samuel C. Pearce, and Authur C. Pike Apr. 1975 12 p refs
(COM-75-10676/5; NOAA-TM-NESS-68; NOAA-75042803) Avail: NTIS CSCL 04B

Estimates of the locations and maximum sustained winds (classifications) of all named tropical cyclones in the North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico during 1974 were made using the technique developed by Dvorak. This technique was applied to pictures from the SMS-1 (Stationary Meteorological Satellite) and ATS-3 (Advanced Technology Satellite) geostationary satellites. These estimates were compared with other data to establish the measure of accuracy achieved. The results are presented together with comments on expected future performance. GRA

N75-31692# Naval Postgraduate School, Monterey, Calif.
TEST AND EVALUATION OF A VTPR RETRIEVAL SYSTEM FROM CLEAR-COLUMN NOAA 2 RADIANCES M.S. Thesis
Harry Milton Dyck, Jr. Mar. 1975 22 p refs
(AD-A009921) Avail: NTIS CSCL 04/2

An iterative technique for the retrieval of temperatures at each of 100 levels ranging from 1000 mb to 0.01 mb is evaluated. Clear-column radiance data in the carbon dioxide channels of the Vertical Temperature Profile Radiometer (VTPR) of NOAA 2 are used in inverting the radiative transfer equations to deduce the T(P) profile. The retrieval technique includes the computation of atmospheric transmittances due to three atmospheric absorber masses (carbon dioxide, water vapor, and ozone) and non-homogeneous temperature-pressure effects along the vertical. The program also corrects these transmittances for zenith path differences between the satellite and the retrieval site when the site is not directly below the sensor. GRA

N75-31693# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
THE SEARCH FOR MOST UNSTABLE SCALES OF DISTURBANCES IN THREE-LAYER ATMOSPHERIC MODELS WITH SHEAR AND STATIC STABILITY PROCEDURE AND RESULTS
W. R. Moninger Dec. 1974 82 p refs
(COM-75-10588/2; NOAA-TR-ERL-314-WPL-36; NOAA-75041104) Avail: NTIS MF $2.25; SOD HC as C55.13:ERL314 CSCL 04B

A program for finding the roots of a complex function is adapted to find buoyancy-wave eigenfunctions of a three-layer atmospheric model. Eigenfunctions are found in stable and unstable regions; the most unstable wavelengths are presented for various sets of model parameters. The program and its use are described, including deck listings and sample runs. GRA

N75-31694# National Weather Service, Garden City, N.Y.
DIGITAL RADAR DATA AND ITS APPLICATION IN FLASH FLOOD FORECASTING
David D. Sisk Mar. 1975 12 p refs
(COM-75-10582/5; NOAA-TM-NWS-ER-59; NOAA-75040803) Avail: NTIS HC $3.25 CSCL 04B

The paper describes digitized radar experiments (D/RADEX) designed to assist in the development, testing and evaluation of techniques for automatic processing and presentation of weather radar data in real-time for operational applications. A minicomputer and its related processing and interface equipment are used to take over control of the radar for approximately twenty seconds to collect radar video returns for archiving and printout displays. A case study is presented that illustrates how D/RADEX can assist in determining areas of potential flash flooding. GRA

N75-31695# Wyoming Univ., Laramie. Water Resources Research Inst.
WATER RESOURCE OBSERVATORY WIND AND SOLAR

RADIATION DATA WATER YEARS 1973 AND 1974
Verne E. Smith Nov. 1974 88 p
(PB-241514/9; W75-07354; OWRT-A-015-WYO(1)) Avail: NTIS HC $4.75 CSCL 04A

Wind data reduced from recording anemometer charts and from readings of totalizing anemometers plus incident solar radiation data are presented in tabular form. The period covered is from October 1972 through September 1974. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N75-31696*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DATA REPORT OF FOUR FREE-DRIFTING BUOYS TRACKED BY THE EOLE SATELLITE IN THE WESTERN NORTH ATLANTIC OCEAN IN THE WINTER OF 1973
John W. Wallace and J. W. Usry Sep. 1975 24 p refs
(NASA-TM-X-72768) Avail: NTIS HC $3.25 CSCL 08C

Data from four free-drifting buoys deployed near Chesapeake Light on February 20, 1973 is presented. Position and water temperature data are presented in tabular and graphic form. Author

N75-31697# World Meteorological Organization, Geneva (Switzerland).
THE METEOROLOGICAL ASPECTS OF ICE ACCRETION ON SHIPS
H. C. Shellard 1974 49 p refs
(WMO-397; MSA-10; ISBN-92-63-10397-6) Avail: NTIS HC $3.75

The main types of icing experienced at sea, their causes, and their relative importance are discussed. The effects of icing on ships, especially fishing vessels are described, and ice accretion at sea is considered in relation to individual meteorological parameters. Current arrangements for reporting ice accretion and for forecasting its likelihood and probable severity are discussed, followed by remarks on the avoidance of the most hazardous form of icing on ships, freezing sea spray. ESRO

N75-31698# Kiel Univ. (West Germany).
PRODUCTION OF MARITIME ORGANISMS UNDER NATURAL CONDITIONS AND IN CULTURES [DIE PRODUKTION MARINER ORGANISMEN UNTER NATUERLICHEN BEDINGUNGEN UND IN KULTUREN]
Peter H. Koske, Juergen Lenz, Walter Nellen, and Bernt Zeitzschel Bonn Bundesmin. fuer Forsch. u. Technol. Apr. 1975 99 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-M-75-01) Avail: NTIS HC $4.75; ZLDI, Munich DM 20.80

The production efficiency achieved so far in the field of marine aquaculture is compared with productivity under natural conditions in the ocean. The chief ecological factors limiting natural productivity are pointed out and the problems and potentialities of aquaculture on various levels of the food chain are discussed. Attention is focussed on unicellular algae as primary producers, herbivorous zooplankton as secondary producers, and the final products mussels, fish, and shrimps, which rely on both food levels and which are used for human consumption. The fourth chapter describes the general laws governing growth in cultured organisms as demonstrated by phytoplankton algae are described. The accumulation of toxic substances in the biomass produced is touched upon. Author (ESRO)

N75-31699# Office of Naval Research, London (England).
OCEANOLOGY IN DENMARK
Thomas L. Miller 1 Dec. 1974 17 p
(AD-A009245; ONRL-R-16-74) Avail: NTIS CSCL 08/10

In spite of the extremely maritime orientation and exposure of the Danish people, oceanography accounts for only a modest fraction (2% of scientists) of its research activity. The principal organizations carrying out this work are the Ministry of Defense (mine and antisubmarine related topics and hydrographic surveys), Ministry of Fisheries, Ministry of Greenland (primarily fisheries oriented activities), Ministry of Environmental Protection (pollution problems), the Ministry of Education (programs in University of Copenhagen and the Technical University of Denmark) and the Ministry of Public Works. Although the total budget is small they maintain an excellent reputation for work in shallow water environments, particularly the low salinity and strong mixing circumstances encountered on their European coasts and Arctic problems near Greenland. GRA

N75-31700# R and D Associates, Santa Monica, Calif.
ON UNIVERSALITY AND SATURATION IN OCEAN INTERNAL WAVES
D. Michael Milder Mar. 1975 38 p refs
(Contract N00014-73-C-0105; ARPA Order 2239)
(AD-A009107; RDA-TR-2702-014) Avail: NTIS CSCL 08/3

The apparent regularity in energy distribution among internal-wave space and time scales may be a saturation phenomenon. This paper develops a model of the saturated internal-wave field based on the hypothesis that the saturated quantity is omega squared N squared, the locally normalized squared vorticity. This quantity, which is a generalized inverse Richardson number for spatially varying flow, is shown in the linearized approximation to be the density of a conserved excitation. The excitation is assumed to be uniformly partitioned among the normal modes in a saturated field. The resulting energy distribution differs from that of Garratt, and Munk in that energy is assigned preferentially to the lowest modes. Among the properties derived for the distribution, and subject to verification by ocean measurements, is a universal law, independent of the stratification profile (n) z, for coherence spectra of isopycnals in the spatial domain. GRA

N75-31701# Naval Ordnance Lab., White Oak, Md.
SOLOMONS FIELD BRANCH
Timothy D. Calderwood 1 Jan. 1975 73 p
(AD-A009322; NOLR-1307) Avail: NTIS CSCL 14/2

The report describes the Naval Surface Weapons Center (White Oak Laboratory) Solomons Field Branch at Solomons, Maryland. Major test ranges and support facilities of the Field Branch are presented and their operations are described. The report is divided into six sections: Introduction, Obtaining Services, Major Facilities, Support Facilities, Environmental Factors, and Capabilities. GRA

N75-31702# SACLANT ASW Research Center, La Spezia (Italy).
TEMPORAL AND SPATIAL VARIABILITY OF WATER MASSES: THE STRAIT OF SICILY (MEDMILOC 72)
Erdogan Ozturgut 1 Apr. 1975 32 p refs
(AD-A008626; SACLANTCEN-SM-65) Avail: NTIS CSCL 08/10

Salinity/Temperature/Depth (STD) stations in the central region of the Strait of Sicily indicated the geostrophic character of the flow and the uniformity of the Levantine Intermediate Water (LIW) at depths below 200 m. Short period STD time series and a longer thermistor array record in this region revealed small fluctuations (max. amplitude less than 5 m) with a semidiurnal period. Current observations at the secondary western sill gave a mean northerly LIW flow of 20 cm/s at a depth of about 250 m. The path of the LIW core in the Sardinia Channel was investigated with closely spaced stations. The results indicated that after crossing the sills the core appeared to flow ENE towards the Tyrrhenian Sea and fanned out after entering the basin, with one branch turning towards the Sardinia Channel. GRA

N75-31703# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
GENERAL RESEARCH PLAN FOR THE FIELD INVESTIGATIONS OF COASTAL DREDGED MATERIAL DISPOSAL AREAS Final Report
Paul R. Becker, Barry W. Holliday, Susan E. Palmer, and Robert M. Engler Apr. 1975 30 p
(AD-A009523; AEWES-Misc-Paper-D-75-13) Avail: NTIS CSCL 13/2

The focal point of the research is a large-scale, interdisciplinary, field investigation program at four existing disposal areas in the Atlantic, Pacific, Gulf of Mexico, and Lake Erie. This report outlines the basic philosophy and general approach that will be

used in the research being conducted at each of these sites. The field research program is divided into three phases. Phase I is the period in which the definition and delimitation of baseline conditions will be determined for the study area and the establishment of a reference area for comparison purposes will be made. The effects of disposal will be investigated during Phase II under experimental, controlled conditions. Phase III will be a period of compiling results, making evaluations, and formulating recommendations. Specific parameters to be investigated are given. Comparable data will be generated at all study areas. A computerized data storage and retrieval system has been established at WES for the reception of these data. GRA

N75-31704# Naval Postgraduate School, Monterey, Calif.
A MEASUREMENT OF NEARSHORE LANGMUIR CIRCULATION
Noel E. J. Boston, Alexander Maratos, J. A. Galt, and E. D. Traganza Apr. 1975 26 p refs
(NR Proj. 083-275; RR1310301)
(AD-A009071; NPS-58BB75041) Avail: NTIS CSCL 08/3

An experiment was carried out to measure vertical velocities associated with Langmuir circulation in Monterey Bay, California. Areas of convergence and divergence marked by windrows were seeded with 20 'micrometers diameter sand. Water samples collected with Nansen bottles were examined with a Coulter counter to determine sand distribution in the vertical columns. A mathematical formulation for the sand distribution was developed in which vertical velocity was entered as a parameter. Matching calculated and observed distributions then gave a value for the vertical velocity associated with the Langmuir circulation. The mathematical model assumes constant coefficients and sinking under the influence of buoyancy forces, vertical advection and diffusion. The Langmuir circulation showed a cellular pattern with vertical velocities of 2.2 cm/sec downward in the area of convergence and 0.8 cm/sec upward in the area of divergence at a wind speed of 6.0 m/sec. These results are in no way to be interpreted as conclusive; their importance lies in that they suggest that the technique described could be useful. Some of the difficulties with the experimental and theoretical methods are discussed. GRA

N75-31705# Coastal Engineering Research Center, Fort Belvoir, Va.
ANALYSIS AND INTERPRETATION OF LITTORAL ENVIRONMENT OBSERVATION (LEO), AND PROFILE DATA ALONG THE WESTERN PANHANDLE COAST OF FLORIDA
James H. Balsillie Mar. 1975 104 p refs
(AD-A009755; CERC-TM-49) Avail: NTIS CSCL 08/6

In 1969, observation and profile stations were established along a 100-mile segment of the western panhandle coast of Florida. Visual measurements of littoral phenomena were taken using systematic techniques of the Littoral Environment Observation (LEO) Program. At six LEO stations, daily observations were made of breaker height, period, and direction of approach, longshore current speed and direction, and windspeed and direction. Foreshore slope was measured daily, and sand samples were collected monthly. Monthly profiles were measured from piers at six localities. Breaker heights were found to increase from east to west. Volume change between consecutive monthly profiles indicate net losses of sediment from the littoral zone along most of the study area, with only serious losses at one locality along the western segment. GRA

N75-31706# Scripps Institution of Oceanography, La Jolla, Calif.
NORPAX HIGHLIGHTS: VOLUME 3, NUMBER 3, APRIL 1975: LARGE-SCALE THERMAL STRUCTURE DURING POLE. PACIFIC SEA LEVEL STATIONS
T. P. Barnett, S. D. Rearwin, and Klaus Wyrtki Apr. 1975 19 p refs
(Contract N00014-69-A-0200-6043)
(AD-A009526) Avail: NTIS CSCL 08/10

Contents: Large-scale thermal structure during POLE; Pacific Sea level stations. GRA

N75-31707# Office of Naval Research, Arlington, Va. Acoustic Environmental Support Detachment.
SEASONAL CRITICAL DEPTH CHARTS AND DEEP SOUND CHANNEL INTERFERENCE FOR THE OCEANS AND SEAS OF THE NORTHERN HEMISPHERE
John J. Audet, Jr. Apr. 1975 64 p refs
(AD-A009524; AESD-TN-75-02) Avail: NTIS CSCL 20/1

The report describes the temporal and spatial variation of the bottom of the deep sound channel for the oceans and seas of the Northern Hemisphere and the extent that the ocean floor interferes with this channel. The distribution of the sound speed data and the development of the critical depth isopleths and topographic interference charts are described. An appendix consisting of sound speeds at 1000-meter intervals for Northern Hemisphere five-degree ocean areas is included. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-31708*# Agnew Tech-Tran, Woodland Hills, Calif.
BIOCHEMISTRY: INVESTIGATION OF THE POLYPHOSPHATE-SYNTHETASE OF SACCHAROMYCES CEREVISIAE
Simone Felter and Andre Stahl Washington NASA Aug. 1975 9 p refs Transl. into ENGLISH from C. R. Acad., Sci. (Paris), v. 280, 28 Apr. 1975 p 1903-1906
(Contract NASw-2789)
(NASA-TT-F-16497) Avail: NTIS HC $3.25 CSCL 06A

The enzyme polyphosphate-synthetase, isolated from the crushing of cells with low phosphate concentrations, was found capable of catalyzing the synthesis of polyphosphates from the orthophosphate. The enzyme is localized in the sedimentary membranous fraction obtained between 400 and 1000 g; its optimal pH level is 7.1, its Km vis-a-vis the orthophosphate is 4.0x10-4M; ATP stimulates the reaction. This enzyme synthesizes primarily short chain polyphosphates. Author

N75-31709# New Hampshire Univ., Durham. Dept. of Botany.
PHYTOPLANKTON POPULATIONS IN RELATION TO DIFFERENT TROPHIC LEVELS AT WINNIPESAUKEE LAKE, NEW HAMPSHIRE, USA
Harry William Yeo and Arthur C. Mathieson Feb. 1973 161 p refs
(PB-240981/1; W75-06354) Avail: NTIS HC $6.25 CSCL 06F

Composition, abundance, and seasonal periodicity of phytoplankton at Lake Winnipesaukee were determined. Trophic levels were evaluated for the entire lake and for eight individual stations. The trophic levels of Lake Winnipesaukee were compared with Newfound and Winnisquam Lakes. The response of phytoplankton to nutrient enrichments of nitrates, phosphates and silicates was evaluated. The differences in phytoplankton numbers (cell/ml) and nutrient levels were compared with previous records at Winnisquam and Newfound Lakes. The nutrient levels at Winnipesaukee were in excess of those previously found at Newfound and Winnisquam Lakes. The species diversity at Winnipesaukee Lake was much greater than at either of the other two lakes. GRA

N75-31710# Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
MODELING THE DYNAMICS OF BIOLOGICAL AND CHEMICAL COMPONENTS OF AQUATIC ECOSYSTEMS
Ray R. Lassiter May 1975 62 p refs
(PB-241987/7; EPA-660/3-75-012) Avail: NTIS HC $4.25 CSCL 06F

To provide capability to model aquatic ecosystems or their subsystems as needed for particular research goals, a modeling strategy was developed. Submodels of several processes common to aquatic ecosystems were developed or adapted from previously existing ones. Submodels are included for photosynthesis as a function of light and depth, biological growth rates as a function of temperature, dynamic chemical equilibrium, feeding and growth and various types of losses to biological populations. These submodels may be used as modules in the construction of models of subsystems of ecosystems. A preliminary model

for the nitrogen cycle subsystem was developed using the modeling strategy and applicable submodels. GRA

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-31711*# Joint Publications Research Service, Arlington, Va.
ROLE OF THE HYPOTHALAMIC NEUROSECRETORY SYSTEM IN ADAPTIVE REACTIONS OF THE BODY: CONTRIBUTION TO THE PROBLEM OF NEUROHORMONAL INTERACTIONS
N. V. Popovichenko Washington NASA Sep. 1975 156 p refs Transl. into ENGLISH of the book "Rol'gipotalamicheskoy Neyrosekretornoy Sistemy v Prisposobitel'nykh Reaktsiyarh Organizma" Kiev, Naukova Dumka Press, 1973 p 1-125
(NASA Order W-13-183)
(NASA-TT-F-16329) Avail: NTIS HC $6.25 CSCL 06P

A review is presented of current research by non-Soviet and Soviet scientists on the role of the hypothalamus in providing defensive and adaptational reactions of the body to stress. Topics discussed include the elaboration and secretion of releasing factors, the neurosecretory system, adrenergic and cholinergic mechanisms, and the interplay of the hypothalamus with extrahypothalamic cerebral structures and endocrine glands. Author

N75-31712# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
A LONG-LIVED, RELIABLE, RECHARGEABLE CARDIAC PACEMAKER
R. E. Fischell, K. B. Lewis (Johns Hopkins Univ.), and J. W. Love (Santa Barbara Medical Clinic) 31 Dec. 1974 65 p refs Presented at Intern. Symp. on Advances in Pacemaker Technol., Erlangen-Nuernberg, West Germany, 26 Sep. 1974 Revised
Avail: NTIS HC $4.25

A rechargeable cell specifically adapted for use at body temperature was incorporated into a pacemaker system that has several advantages: improved reliability, decreased thickness, smaller volume, somewhat lower weight, insensitivity to electromagnetic interference, a long-life lead wire, and essentially unlimited shelf life while awaiting implantation. Low failure rate was achieved by applying space program reliability and quality control techniques to the design, fabrication, and testing of the rechargeable pacemaker. The design of the pacemaker is discussed in detail. Author

N75-31713*# Stanford Univ., Calif. Dept. of Psychiatry and Behavioral Sciences.
INFLUENCE OF CHRONIC AND REPEATED STRESS ON THE PITUITARY-ADRENAL SYSTEM AND BEHAVIOR Final Technical Report
Seymour Levine Sep. 1975 11 p refs
(Grant NGL-05-020-326)
(NASA-CR-143622) Avail: NTIS HC $3.25 CSCL 06S

The role of adrenal glucocorticoids and ACTH in behavior, and the influence of various behavioral situations on the neuroendocrine regulation of the pituitary-adrenal system were investigated. Results are presented and discussed. Author

N75-31714*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering and Physiology and Biophysics.
DEVELOPMENT OF ULTRASONIC METHODS OF HEMODYNAMIC MEASUREMENTS
Michael B. Histand, Francis D. Mcleod, and Charles W. Miller 1 Aug. 1975 37 p refs
(Grant NsG-2009)
(NASA-CR-143458) Avail: NTIS HC $3.75 CSCL 06B

A pulsed ultrasonic Doppler velocity meter which can be used (by modifying transducers) as a flowmeter for blood circulation was experimentally studied. Calculations and profiles of turbulent and laminar flow within blood vessels are shown. Graphs and charts of transducers are included. J.R.T.

N75-31715*# Harvard Medical School, Boston, Mass.
CONTROL MECHANISMS OF CIRCADIAN RHYTHMS IN BODY COMPOSITION: IMPLICATIONS FOR MANNED SPACEFLIGHT Final Report
Martin C. Moore Ede 30 Jun. 1975 173 p ref
(Contract NAS9-14249)
(NASA-CR-144413) Avail: NTIS HC $6.25 CSCL 06P

The mechanisms that underlie the circadian variations in electrolyte content in body fluid compartments were investigated, and the mechanisms that control the oscillations were studied in order to investigate what effects internal desynchronization in such a system would have during manned space flight. The studies were performed using volunteer human subjects and squirrel monkeys. The intercompartmental distribution of potassium was examined when dietary intake, activity, and posture are held constant throughout each 24-hour day. A net flux of potassium was observed out of the body cell mass during the day and a reverse flux from the extracellular fluid into the body cell mass during the night, counterbalanced by changes in urinary potassium excretion. Experiments with monkeys provided evidence for the synchronization of renal potassium excretion by the rhythm of cortisol secretion with the light-dark cycle. Three models of the circadian timing system were formalized. Y.J.A.

N75-31716# School of Aerospace Medicine, Brooks AFB, Tex.
EFFECTS OF THE ABNORMAL ACCELERATORY ENVIRONMENT OF FLIGHT Final Report, Jan. - Jun. 1974
Kent K. Gillingham and Robert W. Krutz, Jr. Dec. 1974 94 p refs
(AD-A009593; SAM-Review-10-74; SAM-TR-74-57) Avail: NTIS CSCL 06/19

A basic description of the physical nomenclature relating to the motional environment of flight is followed by discussions of the physiologic effects of that environment on the human cardiovascular and vestibular system. The effects of -Gz stress and the various means of protecting aircrew against such stress are given special emphasis. The mechanisms of spatial disorientation and motion sickness and the appropriate countermeasures are also presented. GRA

N75-31717# Massachusetts General Hospital, Boston.
ELECTRONIC AUSCULTATION IN TELEMEDICINE Annual Report, 1 Jul. 1974 - 30 Jun. 1975
W. Scott Andrus, Arthur Miller, and Kenneth T. Bird May 1975 36 p refs
(Contracts EMI-72C-001-01; EMI-74C-011-03)
(PB-242009/9) Avail: NTIS HC $3.75 CSCL 06L

The system used for remote auscultation in the Veterans Administration-Massachusetts General Hospital telemedicine link is described. The results of a design study which produced a convenient and effective telestethoscope are summarized, and a study of the accuracy of diagnosis based on transmitted auscultatory breath sounds is discussed. Since visible display of auscultatory sounds may increase the objectivity of diagnosis, a preliminary assessment of one technique was made. Displays of several types of sound are presented. GRA

N75-31718# School of Aerospace Medicine, Brooks AFB, Tex.
RECENT ADVANCES IN AEROSPACE MEDICINE
Wayne F. Kendall, Jr. Mar. 1975 26 p refs
(AD-A009132; SAM-REVIEW-1-75) Avail: NTIS CSCL 06/5

The review provides Air Force flight surgeons information regarding recent advances in operational aerospace medicine. Material was selected for inclusion which deals with the more common problems confronting practicing flight surgeons. The review discusses advances in the administrative, clinical, research, environmental health, and education areas of aerospace medicine. It represents one aspect of continuing education in aerospace medicine for the flight surgeon. GRA

N75-31719# Michigan Univ., Ann Arbor. School of Public Health.
OCULAR ABSORPTION OF LASER RADIATION FOR CALCULATING PERSONNEL HAZARDS Final Report, 1 Nov. 1973 - 31 Oct. 1974
Edward A. Boettner and David Dankovic 30 Nov. 1974 164 p refs
(Contract F41609-74-C-0008; AF Proj. 62202F)

(AD-A009176) Avail: NTIS CSCL 06/18

The transmissions of ultraviolet, visible, and infrared radiation by the cornea, lens, and aqueous humor of rhesus monkeys were measured with spectrophotometers and from this the absorption coefficients were calculated over the spectral range from 200 nanometers in the ultraviolet through 15 micrometers in the infrared. Similar transmission data from previous studies on both human and rhesus monkey eyes were also converted to absorption coefficients. GRA

N75-31720# Army Materiel Command, Texarkana, Tex. Intern Training Center.

EFFECTS OF HIGH TEMPERATURE ON MAINTENANCE PERFORMANCE Final Report

Denis M. Balint Mar. 1975 45 p refs

(AD-A009295; USAMC-ITC-02-08-75-108) Avail: NTIS CSCL 06/19

The objective of the research was to determine whether or not there is a decrease in the efficiency of maintenance performance, when conducted under heat stress conditions, which is detectable prior to the occurrence of visible physical deterioration. Two groups of 10 male subjects were exposed to either a comfortable (72F dry-bulb) or a high temperature (110F dry-bulb) environment. The time to complete a basic electronic maintenance task by each subject was measured and the mean task completion time of each experimental group was calculated for use in the statistical comparison. Experimental results indicate a statistically significant decrease in maintenance performance efficiency because of the increase in temperature. GRA

N75-31721# Air Force Weapons Lab., Kirtland AFB, N.Mex. Technology and Analysis Branch.

LEAD BELT RADIATION SHIELD Final Report, Sep. - Dec. 1974

John J. Burgio Mar. 1975 20 p refs

(AF Proj. 8809)

(AD-A009181; SAT-TN-75-1) Avail: NTIS CSCL 18/6

Results are given of the effectiveness of a lead shielding belt in reducing the gamma dose to the center of a cylindrical tissue-equivalent phantom exposed to isotropic gamma radiation. Three different shield designs were used. The first was a lead belt 20-cm high (wide), of a thickness varying from 0.0 cm (no belt) to 5.08 cm. The second design belt was 30-cm high (wide), of thickness varying from 0.0 cm (no belt) to 5.08 cm. For the third case, the 20-cm high (wide) lead belt of a thickness varying from 0.0 cm (no belt) to 5.08 cm was used but with a lead seat and back. The results demonstrate the feasibility of using a lead belt to reduce the gamma tissue dose to a tissue-equivalent phantom from an isotropic gamma source. GRA

N75-31722# Armed Forces Inst. of Pathology, Washington, D.C.

PROGRESS IN MEDICAL RESEARCH, INCLUDING COMMUNICABLE DISEASES, MILITARY DOG IMPROVEMENT, RADIATION INJURY, AND TROPICAL AND INTERNAL MEDICINE Annual Research Progress Report, 1 Jul. 1973 - 30 Jun. 1974

1 Jul. 1974 87 p

(AD-A008984) Avail: NTIS CSCL 06/5

A summary of research projects is presented. Topics discussed include ethiology of viral hepatitis, experimental filariasis, ultrastructural studies of viral hepatitis, dynamics of aircraft accident victims--computer simulation, lesions in animals fed enzyme inactivated frozen and irradiated beef, and effects of prolonged exposure of the retina to low intensity of continuous wave laser. Author

N75-31723# Armed Forces Radiobiology Research Inst., Bethesda, Md.

RESEARCH PROGRESS IN RADIOBIOLOGY Annual Research Report, 1 Jul. 1973 - 30 Jun. 1974

30 Jun. 1974 151 p refs

(AD-A009327; AFFRRI-ARR-8) Avail: NTIS CSCL 06/18

Contributions in the area of biomedical research and radiobiology are summarized. Biological data relevant to nuclear combat operations is provided with emphasis on use of nuclear weapons in tactical or theater nuclear warfare. GRA

N75-31724# Oceanautics, Inc., Landover, Md.

EXPLORATORY ANALYSIS OF PREDICTORS OF DIVER PERFORMANCE DECREMENT DURING 3 HOUR COLD WATER EXPOSURES

W. S. Vaughan, Jr. and Michael B. Strauss Mar. 1975 50 p refs

(Contract N00014-72-C-0309; NR Proj. 197-019)

(AD-A009359) Avail: NTIS CSCL 06/19

Tasks involving perceptual/cognitive processes were performed by eight Navy divers either during or following 3-hour exposures to both 4.5C and 15.5C water. Analysis of performance means had shown significant decrements in task performance as a function of exposure time, but not as a function of water temperature differences. The current analysis was designed to further explore potential relationships between task performance decrement and body cooling, and between body cooling and physical characteristics of the test divers. GRA

N75-31725# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

INVESTIGATION OF INERTIAL PROPERTIES OF THE HUMAN BODY Final Report, Apr. 1972 - Dec. 1974

R. F. Chandler, C. E. Clauser, J. T. McConville, H. M. Reynolds, and J. W. Young Mar. 1975 168 p refs Prepared in cooperation with Civil Aeromedical Inst., Oklahoma City, Okla. and Webb Associates, Inc., Yellow Springs, Ohio

(Contract DOT-HS-017-2-315-1A)

(PB-241566/9; AMRL-TR-74-137; DOT-HS-801-430) Avail: NTIS HC $6.25 CSCL 05E

Knowledge of the anthropometric parameters of the human body is essential for understanding of human kinetics and particularly for the design and testing of impact protective systems. Considerable information is available on the size, weight and center of mass of the body and its segments. The report supplements existing information with data regarding mass distribution characteristics of the human body as described by the principal moments of inertia and their orientation to body and segment anthropometry. The weight, center of mass location and principal moments of inertia of six cadavers were measured, the cadavers were then segmented and the mass, center of mass, moments of inertia and volume were measured on the fourteen segment from each cadaver. GRA

N75-31726# Office of Naval Research, Arlington, Va.

A USER ORIENTED REVIEW OF THE LITERATURE ON THE EFFECTS OF SLEEP LOSS, WORK-REST SCHEDULES, AND RECOVERY ON PERFORMANCE

Donald P. Woodward and Paul D. Nelson Dec. 1974 41 p refs

(RR0410102)

(AD-A009778; ONR-ACR-206) Avail: NTIS CSCL 06/19

The review provides a brief systematically organized account of the information from the scientific literature on the effects of sleep loss and work-rest schedules on performance. The orientation is practical, but consistent with the available data. A brief narrative description and a series of summary statements about the effects of sleep loss and work-rest schedules on human performance as they apply to operational settings is presented. Recovery from sleep loss effects as well as costs related to sleep loss effects are discussed briefly. Suggestions for future research are presented. GRA

N75-31727# Naval Aerospace Medical Research Lab., Pensacola, Fla.

HUMAN BIOASSAY OF ANTIMOTION SICKNESS DRUGS

Ashton Graybiel, Charles D. Wood, James Knepton, John P. Hoche, and Gene F. Perkins 2 Apr. 1975 28 p refs

(MF51524005)

(AD-A009799; NAMRL-1215) Avail: NTIS CSCL 06/15

Great individual differences in response to antimotion sickness drugs administered in usual doses were revealed. In one experiment (involving 11 subjects and 7 drugs) the single best therapeutic response implicated all seven drugs tested (three single drugs and four fixed-dose combinations). In terms of percentage of subjects demonstrating a substantial beneficial antimotion sickness drug effect, administration of a fixed-dose combination of promethazine hydrochloride and ephedrine sulfate (25 mg each) proved to be outstanding; this combination of

homergic drugs clearly exhibited a suprasummation effect. A few tests were conducted using larger than usual doses and the results support previous findings that for a maximal beneficial effect in response to a single dose, individuals may vary both with regard to the choice of drug and the amount administered. GRA

N75-31728# Naval Aerospace Medical Research Lab., Pensacola, Fla.
FREQUENCY RESPONSE OF THE OCULOVESTIBULAR SYSTEM DURING YAW OSCILLATION
W. Carroll Hixson 8 Dec. 1974 32 p refs
(MF51524005)
(AD-A009769; NAMRL-1212) Avail: NTIS CSCL 06/19

The report describes the results of a system transfer function type study of the oculovestibular response to sinusoidal yaw angular oscillations of the head. Ten naval aviator candidates were exposed to earth-vertical rotation about the z head axis at nine different, octave-separated stimulus frequencies covering the 0.005 to 1.28 Hz spectrum with peak velocity of the stimulus held constant at 50 deg/sec. The frequency dependence of the oculovestibular system was interpreted in terms of phase and amplitude measures of the slow component eye velocity element of the resulting horizontal nystagmus. Though the phase data collected at the lower stimulus frequencies deviated somewhat from those predicted by the conventional second-order model of cupula-endolymph response, a theoretical account for the deviation was postulated by introducing an adaptation transfer function as developed by other investigators. GRA

N75-31729# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN AND CONSTRUCTION OF A COMPUTER CONTROLLABLE MULTI-CHROMATIC STIMULUS FOR HUMAN VISUAL SYSTEM TESTING AND MODELING M.S. Thesis
Harold L. Hannickel Dec. 1974 97 p refs
(AD-A008678; GE/EE/74-46) Avail: NTIS CSCL 05/10

The report describes the construction and operation of a computer controllable, sine wave grating stimulus for use in the investigation of human visual system modulation transfer functions. The stimulus can be controlled in spatial frequency, orientation and contrast by a digital computer through digital-to-analog converters. The apparatus uses a commercial color television receiver to produce a 10 inch diameter stimulus capable of 50 foot-lamberts, 30 cycles per degree of field when viewed at 25 feet and the color spectrum of P22A (tri-color: blue, green, red) phosphors. The equipment described has been built, tested and successfully demonstrated under computer control. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-31730# Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF THE EFFICIENCY OF HUMAN PERFORMANCE IN SPACE FLIGHT
G. T. Beregovoy, N. V. Krylova, I. B. Solovyeva, and G. P. Shibanov 18 Aug. 1975 9 p refs Transl. into ENGLISH from Vop. Psikhologii (Moscow), no. 4, Jul. - Aug. 1974 p 3-9
(JPRS-65477) Avail: NTIS HC $3.25

An assessment of the efficiency and the dynamics of human performance in space flight is given. Author

N75-31731*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NOISE AND SPEECH INTERFERENCE: PROCEEDINGS OF MINISYMPOSIUM
William T. Shepherd, ed. Sep. 1975 230 p refs
(NASA-TM-X-72696) Avail: NTIS HC $7.50 CSCL 05E

Several papers are presented which deal with the psychophysical effects of interference with speech and listening activities by different forms of noise masking and filtering. Special attention was given to the annoyance such interruptions cause, particularly that due to aircraft flyover noises. Activities such as telephone listening and television watching were studied. A number of experimental investigations are described and the results are analyzed. D.M.L.

N75-31732*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONSPICUITY OF TARGET LIGHTS: THE INFLUENCE OF FLASH RATE AND BRIGHTNESS
Mary M. Connors Washington Sep. 1975 17 p refs
(NASA-TN-D-7961; A-5792) Avail: NTIS HC $3.25 CSCL 05E

The stimulus characteristics of lights that might aid a pilot to see and avoid, by alerting him to a potential threat were studied. The relative conspicuity of foveally equated, point-source, steady and flashing lights of several brightnesses, seen against a star background was examined. From the subject's viewpoint, these target lights could appear anywhere within a large (40 deg horizontal by 35 deg vertical) field of view. The lights appeared at random time intervals while the subject was periodically distracted by a simulated cockpit task. The results indicate that correct target detection increases and reaction time decreases with increased target intensity. Steady lights are missed more frequently and acquired more slowly than flashing lights, but no significant differences are found among the wide range of flash rates employed. The intensity of the light has a greater effect on both detection and reaction time to steady lights than to flashing lights. These results are compared with results of other researchers who used targets which appeared at fixed locations. The longest reaction times were recorded to lights which appeared either at the extremes or at the very center of the visual field. Author

N75-31733# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Abteilung Luftfahrtpsychologie.
THE VISUAL-MOTOR-ORIENTATION OF THE DIVER IN THE WORKING SPACE DEPENDING ON EXPERIENCE AND WATER TURBIDITY
Klaus-Martin Goeters 14 Apr. 1975 22 p refs In GERMAN; ENGLISH summary
(DLR-FB-75-35) Avail: NTIS HC $3.25; DFVLR, Cologne DM 7.70

Whether the visual-motor-coordination of the professional diver is influenced by the well known visual distortions under water was tested. It was found that the visual-motor-coordination of experienced divers (3,000-10,000 hours of diving) is well adapted to the under water conditions. Less experienced divers (100-300 hours) showed clear distortions in their size and depth estimations. Size estimations did not depend on water turbidity (1 m vs. 10 m of visibility), but depth estimations did. Author (ESRO)

N75-31734# Haskins Labs., New Haven, Conn.
EXPLOITATION OF CENTRAL MECHANISMS IN LISTENING TO NOISY SPEECH Final Report
28 Feb. 1975 21 p refs
(Contract N00014-67-A-0129-0001)
(AD-A009886) Avail: NTIS CSCL 17/2

This report describes the results obtained from an experimental study of a form of dichotic listening applied to speech with the objective of avoiding the phenomenon known as upward spread of masking. The study goes further to explore the effects of adjusting the relative time of arrival of the speech formant components at the two ears and the consequences of dichotic listening on the perception of speech in noise. GRA

N75-31735# Rockwell International Corp., Anaheim, Calif. Autonetics Div.
ALTERNATIVE APPROACHES TO MODELING VISUAL TARGET ACQUISITION Technical Publication, Jun. - Aug. 1974
Charles P. Greening Sep. 1974 32 p refs
(Contract N00123-74-C-0236)
(AD-B000465; NWC-TP-5698) Avail: NTIS CSCL 17/8

A framework is developed which structures the variety of modeling approaches that might be taken in quantifying visual target acquisition. Significant omissions in current modeling efforts

are identified. Past modeling approaches are described, including those emphasizing cognitive and subjective approaches. It is concluded that mathematical modeling is so dependent upon (1) the objectives of the user, (2) the class of situation being modeled, and (3) the methodological orientation of the modeler, that a single model cannot meet all requirements. Author (GRA)

N75-31736# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MODELING THE SATURATION LEVEL OF A HUMAN RADAR OPERATOR M.S. Thesis
Dahl B. Metters Dec. 1974 101 p refs
(AD-A009203; GE/EE/74-73) Avail: NTIS CSCL 05/9

The United States Air Force is building a mathematical model of the air battle and needs, as an input, a model of the saturation level of the groundbased enemy radar operator. Saturation level can be loosely defined as the number of targets that the human operator can effectively manage. The concept of an ideal operator is introduced to allow the precise definition of saturation level. An ideal operator is defined as an operator who can perform a certain amount of work per unit time perfectly. The amount of work that the ideal operator can perform is termed the operator's saturation level. The human operator is then modeled as an ideal operator who makes random errors. The human operator's saturation level is then estimated from a series of measurements as a function of the human:s maximum time-between-errors. An experiment which was conducted to measure saturation level is described in detail and the results are presented. The resulting data are then analyzed using the Kolmogorov-Smirnov and Likelihood Ratio tests. GRA

N75-31737# Design Plus, St. Louis, Mo.
BEHAVIORAL TAXONOMY OF UNDERGRADUATE PILOT TRAINING TASKS AND SKILLS: EXECUTIVE SUMMARY Final Report, Jul. 1973 - Sep. 1974
Robert P. Meyer, Jack I. Laveson, Neal S. Weissman, and Edward F. Eddowes Dec. 1974 26 p refs
(Contract F41609-73-C-0040; AF Proj. 1123)
(AD-A008771; AFHRL-TR-74-33-1) Avail: NTIS CSCL 05/9

The report summarizes the development and application of a behavioral taxonomy of undergraduate pilot training (UPT) tasks and skills. The taxonomy specifies the fundamental flying abilities which comprise the training objectives of UPT. Its purpose is to provide a broadly applicable conception of UPT that obviates the need to continually study each specific training task or aircraft to determine the requirements for training hardware and software in research on and the development of optimized flying training programs. GRA

N75-31738# Design Plus, St. Louis, Mo.
BEHAVIORAL TAXONOMY OF UNDERGRADUATE PILOT TRAINING TASKS AND SKILLS: GUIDELINES AND EXAMPLES FOR TAXONOMY APPLICATION IN FLYING TRAINING RESEARCH Final Report, Jul. 1973 - Sep. 1974
Robert P. Meyer, Jack I. Laveson, and Neal S. Weissman Dec. 1974 191 p refs
(Contract F41609-73-C-0040; AF Proj. 1123)
(AD-A008897; AFHRL-TR-33-4) Avail: NTIS CSCL 05/9

The report presents the results of the third phase of a research program to develop a behavioral taxonomy of undergraduate pilot training (UPT) tasks and skills. The Phase III effort consisted of the continued development of surface analyses to include instrument flight maneuvers, the classification of the resulting surface analysis information and its integration within the taxonomic data system, an analysis of future UPT objectives in terms of present and future flying training requirements and the development of four applications of the taxonomic data system to flying training research problems. The illustrative examples dealt with skill comparisons among different tasks, the determination of skill difficulty within and between tasks, developing standard training tasks and generating new training tasks to teach specific flying skills. GRA

N75-31739# Air Force Human Resources Lab., Brooks AFB, Tex.
TRANSFER OF TRAINING WITH FORMATION FLIGHT TRAINER Interim Report
Gary B. Reid and Michael L. Cyrus Dec. 1974 14 p refs
(AF Proj. 1123)
(AD-A009638; AFHRL-TR-74-102) Avail: NTIS CSCL 05/9

The present research was conducted to determine transfer of practice from a formation simulator to aircraft formation flying. Evidence in support of positive transfer was obtained by comparing students trained in the formation simulator with students who were essentially untrained and with students trained in the aircraft. This design provided data for a direct comparison with five simulator sorties with two aircraft sorties in an effort to quickly establish a training cost/transfer comparison. GRA

N75-31740# Cornell Univ., Ithaca, N.Y.
THE IMPLICATIONS OF EXPERIMENTS ON THE PERCEPTION OF SPACE AND MOTION Final Report
James J. Gibson 1975 63 p refs
(Contract N00014-67-A-0077-0005)
(AD-A009399) Avail: NTIS CSCL 05/10

Research on space perception and the perception of motion in space is discussed. Topics discussed include evidence for the direct perception of surface layout, the discovery of visual kinesthesis, experiments on the perception of changing surface layout, and the apprehension of hidden surfaces. Author

N75-31741# Naval Postgraduate School, Monterey, Calif.
EVALUATION OF SLIDE-TAPE LECTURE PROGRAMS USED IN AERO LABORATORIES M.S. Thesis
Frank Donald Schwikert Mar. 1975 50 p refs
(AD-A009571) Avail: NTIS CSCL 05/9

Overcrowded conditions, unavoidable absence, and the lack of standardization in a course can detract from the learning experience. In an attempt to solve these problems, fully automatic slide-tape programs have been developed for use in the gasdynamics laboratory course. In order to improve these lecture packages, the students have been asked to evaluate them. A significant portion of this research is devoted to the development of a detailed questionnaire to sample student reaction to the slide-tape lecture format. GRA

N75-31742# Applied Psychological Services, Wayne, Pa. Science Center.
IDENTIFICATION AND MEASUREMENT OF INTELLECTIVE LOAD CARRYING THRESHOLDS Final Report
Arthur I. Siegel and Allan R. Williams, Jr. Dec. 1974 113 p refs
(Contract F44620-73-C-0040; ARPA Order 2374)
(AD-A009159; AFOSR-75-0593TR) Avail: NTIS

The conjecture was investigated that the intellective load carrying capability for selected intellective functions is identifiable and measurable. Intellective load carrying failure was defined as the point at which a change in transfer function components occurs as a tracking and a scaled intellective function were concomitantly performed. The scaled intellective functions were drawn from the Guilford Structure-of-Intellect model. The transfer function components included amplitude ratio and phase lag as defined by the frequency-response analytic method. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-31743*# ILC Industries, Inc., Dover, Del.
ON DEVELOPMENT OF A SEALED BEARING FOR SPACE SUITS Final Report
J. Rayfield [1975] 15 p
(Contract NAS9-14399)
(NASA-CR-144435) Avail: NTIS HC $3.25 CSCL 06K

The work to correct several design deficiencies present in the bearings used in the orbital extravehicular spacesuit is reported. These deficiencies included: difficult stitch-on interface between fabric and outer race; a tendency for the clamping threads to seize; and, most importantly, the failure of the sealing surfaces (Teflon seat, Delrin seal) to maintain integrity with cycling. The

first problem was corrected by raising the stitch-on holes so as to be more accessible. The seizing was eliminated by changing to a coarser thread, from 32/inch to 24/inch. The solution to the sealing problem required a materials evaluation, candidate material selection, and adhesive evaluation (for bonding the seat material to the outer race) and bench-cycling of candidate seal/seat combinations. The final configuration, successfully bench-cycled and delivered to NASA, is shown. Author

N75-31744*# Technology, Inc., Houston, Tex. Life Sciences Div.
SPECIAL REPORT: OCCLUSIVE CUFF CONTROLLER
Joseph T. Baker 1 Oct. 1975 36 p refs
(Contract NAS9-13291)
(NASA-CR-144430) Avail: NTIS HC $3.75 CSCL 06B

A mechanical occlusive cuff controller suitable for blood flow experiments in space shuttle flights is described. The device requires 115 volt ac power and a pressurized gas source. Two occluding cuff pressures (30 and 50 mmHg) are selectable by a switch on the front panel. A screw driver adjustment allows accurate cuff pressurization levels for under or oversized limbs. Two pressurization cycles (20 second and 2 minutes) can be selected by a front panel switch. Adjustment of the timing cycles is also available through the front panel. A pushbutton hand switch allows remote start of the cuff inflation cycle. A stop/reset switch permits early termination of the cycle and disabling of the controller to prevent inadvertent reactivation. Pressure in the cuff is monitored by a differential aneroid barometer. In addition, an electrocardiogram trigger circuit permits the initiation of the pressurization cycle by an externally supplied ECG cycle. Author

N75-31745*# ILC Industries, Inc., Dover, Del.
ON DEVELOPMENT OF AN INEXPENSIVE, LIGHTWEIGHT THERMAL MICROMETEROID GARMENT FOR SPACE SUITS Final Report
16 Jul. 1975 156 p
(Contract NAS9-14199)
(NASA-CR-144428) Avail: NTIS HC $6.25 CSCL 06K

A lightweight and inexpensive coverlayer developed for space suits is described. Material selection, procurement, and testing, pattern design, and prototype fabrication are discussed. By using the minimum required cross section necessary for earth orbital mission, by utilizing the lightest weight materials possible, and by decreasing the use of weight costly taping a lightweight and economical thermal micrometeroid garment was developed. Simplification of manufacturing techniques and use of off-the-shelf materials helped to reduce costs. J.M.S.

N75-31746*# Hamilton Standard, Windsor Locks, Conn.
THERMAL CONTROL EXTRAVEHICULAR LIFE SUPPORT SYSTEM Final Report, Jun. 1973 - Aug. 1975
Aug. 1975 371 p refs
(Contract NAS9-13574)
(NASA-CR-144425; SPO-3T75) Avail: NTIS HC $10.00 CSCL 06K

The results of a comprehensive study which defined an Extravehicular Life Support System Thermal Control System (TCS) are presented. The design of the prototype hardware and a detail summary of the prototype TCS fabrication and test effort are given. Several heat rejection subsystems, water management subsystems, humidity control subsystems, pressure control schemes and temperature control schemes were evaluated. Alternative integrated TCS systems were studied, and an optimum system was selected based on quantitative weighing of weight, volume, cost, complexity and other factors. The selected subsystem contains a sublimator for heat rejection, bubble expansion tank for water management, a slurper and rotary separator for humidity control, and a pump, a temperature control valve, a gas separator and a vehicle umbilical connector for water transport. The prototype hardware complied with program objectives. Author

N75-31747*# Chemtric, Inc., Rosemont, Ill.
VAPOR COMPRESSION DISTILLATION MODULE
P. P. Nuccio Jun. 1975 197 p refs
(Contracts NAS9-13714; NAS9-14234; NAS9-10273)
(NASA-CR-144424; Rept-3110) Avail: NTIS HC $7.00 CSCL 06K

A Vapor Compression Distillation (VCD) module was developed and evaluated as part of a Space Station Prototype (SSP) environmental control and life support system. The VCD module includes the waste tankage, pumps, post-treatment cells, automatic controls and fault detection instrumentation. Development problems were encountered with two components: the liquid pumps, and the waste tank and quantity gauge. Peristaltic pumps were selected instead of gear pumps, and a sub-program of materials and design optimization was undertaken leading to a projected life greater than 10,000 hours of continuous operation. A bladder tank was designed and built to contain the waste liquids and deliver it to the processor. A detrimental pressure pattern imposed upon the bladder by a force-operated quantity gauge was corrected by rearranging the force application, and design goals were achieved. System testing has demonstrated that all performance goals have been fulfilled. Author

N75-31748# Human Engineering Labs., Aberdeen Proving Ground, Md.
HELMET-MOUNTED DISPLAY IMPLICATIONS FOR ARMY AVIATION Final Report
Alan M. Poston and William B. DeBellis Mar. 1975 28 p refs
(AD-A009507; HEL-TN-7-75) Avail: NTIS CSCL 05/8

This report contains a compilation of information pertaining to helmet-mounted displays (HMDs). The topics discussed include methods of mounting the HMD, methods of resolving the line of sight, methods of presenting information, fields of view and weight considerations. Comparisons are made between HMD display techniques and other display methods. Various ramifications of implementing an HMD into U.S. Army helicopters are considered. GRA

N75-31749# School of Aerospace Medicine, Brooks AFB, Tex.
A GRAPHICAL SUMMARY OF OXYGEN REGULATOR PERFORMANCE Interim Report, Apr. - Sep. 1974
Paul J. Zalesky and Ronald D. Holden Apr. 1975 30 p refs
(AF Proj. 7164)
(AD-A009134; SAM-TR-75-12) Avail: NTIS CSCL 14/2

The static performance characteristics of USAF oxygen regulators were evaluated utilizing the regulator test stand at USAFSAM. Outlet suction pressures, flows, positive pressures, and delivered oxygen dilutions were observed and plotted as functions of operational altitudes. General findings indicated that: (1) excessive oxygen addition occurs in all models, especially at low cabin altitudes; (2) positive pressure schedules generally conform to specifications; (3) negative suction pressures for most regulators are less than -1.0 in. H2O. The validity of static evaluation is discussed and data interpretation is considered with respect to biomedical compatibility that emphasizes maintenance of crewmember physiological sufficiency. GRA

N75-31750# Army Materiel Command, Texarkana, Tex. Intern Training Center.
A STUDY OF PROPOSED EAR PROTECTION DEVICES FOR LOW FREQUENCY NOISE ATTENUATION Final Report
Patrick Michael Dallosta Apr. 1975 143 p refs
(AD-A009274; USAMC-ITC-02-08-75-004) Avail: NTIS CSCL 06/17

The investigation was undertaken to evaluate several methods of ambient noise attenuation, proposed by Columbia Broadcasting Systems, and Bolt, Beranek, and Newman. It also explores the new developments in the area of active noise supression. The end result of the attenuation method was the employment of the selected device in the SPH-4 helmet. Both companies proposed new models and suggestions for not only active, but also passive systems. The results of the study indicate that the best form of attenuation lies with the passive methods. GRA

N75-31751# Army Materiel Command, Texarkana, Tex. Intern Training Center.
COMPUTER MODEL TO DETERMINE CENTER OF GRAVITY AND MOMENTS OF INERTIA FOR PROTECTIVE HELMETS Final Report
Don Allan Slaymaker Apr. 1975 55 p refs
(AD-A009285; USAMC-ITC-02-08-75-001) Avail: NTIS CSCL 06/17

The purpose of the study is to describe a computer model that will provide the parameters, center of gravity, moments of inertia and perceived protective area for combat helmets. The model is intended to be a design tool for use in the development of new helmets: it will also provide data on helmets already in use. The helmet is approximated by a series of flat triangular plates. The above parameters for each triangular increment are available in geometry text books. The perceived area is the actual area of the triangle times the dot product of a unit vector normal to the flat plate. A hollow hemisphere is used to test the accuracy of the model. Model accuracy is proved to be quite good. GRA

N75-31752# Army Materiel Command, Texarkana, Tex. Intern Training Center.
SYSTEM SAFETY EVALUATION OF LIFE SUPPORT SYSTEMS FOR CHEMICAL AND BIOLOGICAL PROTECTIVE SUITS Final Report
Richard B. Belmonte Apr. 1975 84 p refs
(AD-A009312; USAMC-ITC-02-08-75-401) Avail: NTIS CSCL 06/17

The paper presents a system safety analysis of two air supply sub-systems which are to be used with a chemical and biological protective suit system. The backpack assembly sub-system has been developed and tested already, whereas the remote air supply apparatus has not yet been developed. The system safety analysis of each air supply sub-system includes mission analysis, preliminary hazard analysis, failure mode and effect analysis, flow analysis and fault tree analysis. A reliability model and block diagram of each sub-system is also included. The results of these analyses indicate that with proper maintenance and trained personnel the safety provided by these sub-systems should be acceptable. GRA

N75-31753# Bureau of Radiological Health, Rockville, Md.
PRELIMINARY EVALUATION OF COMMERCIALLY AVAILABLE LASER PROTECTIVE EYEWEAR Technical Report, 1971-1975
Kenneth R. Envall, Marshall Coakley, Richard W. Peterson, and Robert J. Landry Mar. 1975 42 p refs
(PB-241903/4; DHEW/FDA-75-8026) Avail: NTIS HC $3.75 CSCL 06Q

Preliminary data are presented for 17 laser protective eyewear types; eight were intended to provide protection against argon-ion laser radiation, and nine were intended to provide protection against neodymium-yttrium-aluminum garnet laser radiation. Both lens and frame materials were exposed to the direct laser beam at increasing power density values up to 12 W/sq cm. The eyewear test systems, structural changes in the materials, and observations on eyewear labeling are described. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N75-31754*# Transemantics, Inc., Washington, D.C.
LIFE IN THE UNIVERSE AND MAN IN SPACE
N. Dubinin and O. Gazenko Washington Sep. 1975 13 p Transl. into ENGLISH from Izv. (USSR), 6 Jul. 1975 and Knizhoye Obozreniye (USSR), no. 1, Jan. 1975
(Contract NASw-2792)
(NASA-TT-F-16563) Avail: NTIS HC $3.25 CSCL 06F

The book, Foundations of Space Biology and Medicine, coauthored by Soviet and American scientists, is reviewed. D.M.L.

N75-31755*# Joint Publications Research Service, Arlington, Va.
EXOBIOLOGY OF THE MOON
G. P. Vdovykin Washington NASA Aug. 1975 104 p refs Transl. into ENGLISH from Izd-vo Nauka (Moscow), 1975 119 p
(NASA Order W-13183)
(NASA-TT-F-16378) Avail: NTIS HC $5.25 CSCL 03B

Some fundamental problems involved in the exobiology (space biology) of the moon have been clarified through investigations of the moon and the materials of which it consists, samples of which have been brought to the earth by automatic and manned space stations. These problems include the possible presence of lunar forms of life, the conditions for man's presence on the moon, the presence of organogenic (entering into the composition of living matter) chemical elements and their compounds, and the search for some idea concerning the sources of carbon in lunar surface material. Numerous results obtained recently are generalized. Author

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N75-31756# National Physical Lab., Teddington (England). Div. of Computer Science.
[ACTIVITIES OF THE DIVISION OF COMPUTER SCIENCE] Progress Report, 1972 - 1973
Apr. 1974 57 p refs
(NPL-Com-74) Avail: NTIS HC $4.25

Progress was made in the field of data communications and computer networks. Work on pattern recognition with applications to handwritten characters, speech, and signature verification-systems for the storage and retrieval of textual information- and human factors in interactive systems is reported. Publications by the staff of the Division as well as other references are also included. ESRO

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N75-31757 Purdue Univ., Lafayette, Ind.
THE DEVELOPMENT OF A GENERAL PURPOSE INTERACTIVE GRAPHICS SYSTEM Ph.D. Thesis
David Carleton Anderson 1974 118 p
Avail: Univ. Microfilms Order No. 75-17148

A detailed view is presented of the development of a general purpose, multi-computer, interactive graphical programming system. The treatment emphasizes the design methodology and implementation procedures involved in creating a programming base for applications in minicomputer graphics. The system development is examined at three software levels: applications, support, and system. A pseudo real-time dynamic display system is described that involves a host-satellite computer configuration to display time varying scenes. A subroutine package facilitates the generation of a time sequenced, three dimensional picture data file in the host processor. The picture is transformed into a compressed two dimensional display file and transferred to the satellite minicomputer disk. The display program on the programmable CRT permits interactive control of the picture, including stop-action and time scaling. The development of minicomputer software is examined from the operating system to a graphics package for a three dimensional display processor. Dissert. Abstr.

N75-31758 California Univ., Los Angeles.
A COMBINATORIAL RELAXATION ALGORITHM FOR CONCAVE MINIMIZATION SUBJECT TO LINEAR INEQUALITY CONSTRAINTS Ph.D. Thesis
Manuel Jesus Carrillo 1975 94 p
Avail: Univ. Microfilms Order No. 75-16774

A finite algorithm for finding the global solution of a general concave minimization problem with linear inequality constraints is described and has been implemented. The problem studied arises in many areas of applications, such as problems

with economies of scale. The proposed solution method uses combinatorial and relaxation ideas along with the property that some vertex is an optimal solution. Upper and lower bounds to the optimal functional value are found and improved. When equality of the bounds is reached, the feasible point that attains the upper bound is optimal. For the purpose of obtaining the bounds, the algorithm finds the vertices on some faces of certain 'relaxed' polyhedrons. In general, the total number of points found is relatively small to that obtained in a total enumeration of vertices of the feasible region. Degeneracy does not present any problem. Dissert. Abstr.

N75-31759 Texas Univ., Austin.
COMPUTER RECOGNITION OF PARTIAL VIEWS OF THREE DIMENSIONAL CURVED OBJECTS Ph.D. Thesis
James William Mckee 1975 132 p
Avail: Univ. Microfilms Order No. 75-16708

Two similar algorithms are described: one for learning descriptions of three dimensional curved objects, the other for recognizing partial views of known objects. The input to either algorithm comes from a television camera connected to a computer. Both algorithm use a library of known objects. The learning algorithms sees the whole object to be learned and computes a description of the object; the output is an updated library of known objects in which the description and name of the new objects are added to the library. The recognition algorithm sees only a partial view of a known object. The algorithm computes a description of the partial view and compares this description to that of known objects; the output is a list of possible names of the partial view with a measure of how well each object named matched the partial view. Dissert. Abstr.

N75-31760# Aeronautical Research Labs., Melbourne (Australia).
SIMULATING A TIME-SHARING COMPUTER SYSTEM
R. C. Adams Mar. 1975 63 p refs
(ARL/Struc-Rept-357) Avail: NTIS HC $4.25

A very precise technique for simulating a time-sharing computer system is presented. One of its uses is to analyze the effects of software changes or hardware reconfiguration on system performance. An application of the method to a DECsystem-10 is described and the results of three simple experiments presented. An analysis of the advantages and disadvantages of this method compared to other available techniques is also given. Although the method is exact, the implementation effort is probably smaller than for a conventional system simulation and certainly much smaller than for one of equivalent accuracy. Author

N75-31761*# College of William and Mary, Williamsburg, Va. Dept. of Mathematics.
SYSTEM BALANCE ANALYSIS FOR VECTOR COMPUTERS
John C. Knight, William G. Poole, Jr., and Robert G. Voight May 1975 29 p refs
(Grant NGR-47-102-001; Contract N00014-73-A-0374-0001; NR Proj. 044-459)
(NASA-CR-143518; AD-A009430; TR-7) Avail: NTIS HC $3.75 CSCL 09/2

The availability of vector processors capable of sustaining computing rates of 10 to the 8th power arithmetic results per second raised the question of whether peripheral storage devices representing current technology can keep such processors supplied with data. By examining the solution of a large banded linear system on these computers, it was found that even under ideal conditions, the processors will frequently be waiting for problem data. Author (GRA)

N75-31762# RAND Corp., Santa Monica, Calif.
THE RAND MONITOR/STIMULUS-GENERATOR: A SIMPLE APPROACH TO RESPONSE TIME ANALYSES IN ON-LINE COMPUTER SYSTEMS Interim Report
Jo Ann Lockett and Thomas E. Bell May 1975 34 p refs
(Contract F44620-73-C-0011)
(AD-A009843; R-1649-PR) Avail: NTIS CSCL 09/2

Analysis of on-line systems often requires that loads be input to measure system response time. The loads can be artificial or natural--both have their drawbacks. Precise replication of natural loads cannot be attained, making accurate comparisons of system responses nearly impossible. Artificial loads, on the other hand, are not always applicable, since they do not replicate real user activity and generally represent a much lower level of demand. This report describes an analysis technique that uses a combination of natural and artificial loading, employing the advantages of each. The Rand Monitor/Stimulus-Generator (RMS) was built to aid in the development of the analysis techniques. The RMS interfaces between the terminal and communication lines; it stimulates the system by inserting a prestored message into the natural work stream repeatedly and measuring the resulting response times for the message. The load, then, is totally natural except for the small, incremental artificial load introduced by the measurement. GRA

N75-31763# Naval Research Lab., Washington, D.C.
A CDC-3800 FORTRAN SUBROUTINE TO PERFORM NONRECURSIVE DIGITAL FILTERING OF REAL DATA Final Report
Thomas H. Gauss Apr. 1975 33 p
(NRL Proj. R05-09A)
(AD-A009767; NRL-MR-3026; NRL-Bull-42) Avail: NTIS CSCL 09/4

Many classes of engineering problems require the selective spectral filtering of real-valued input data. A FORTRAN subroutine, DIGFIL, has been written which (1) uses Helm' '5 T's' method to design an effective nonrecursive digital filter, (2) implements the filter in terms of its impulse response coefficients, and (3) uses fast convolution techniques to convolve a sufficiently sampled input data sequence with the previously generated filter coefficients. Any amount of input data may be filtered by making a sufficient number of calls to DIGFIL. At the user's option, a plot of the frequency response of the specified filter can be generated and compared with the corresponding ideal filter response. Low-pass, high-pass, band-pass and band-reject filters can be simulated using DIGFIL. For each filter the user must specify the sampling frequency used, the desired frequency resolution, the lower and upper passband transition frequencies, an upper bound on the amount of stopband attenuation required, and the number of input data points to be filtered during the current call to DIGFIL. DIGFIL converts these desired specifications into an achievable nonrecursive digital filter, if possible, and then performs the desired filtering. GRA

N75-31764# Picatinny Arsenal, Dover, N.J. Management Information Systems Directorate.
PROPERTIES OF IRREGULAR PARTS SYSTEM Final User Manual
Robert E. Barnas and Robert I. Isakower Feb. 1975 178 p refs
(AD-A009583; MISD-UM-75-2) Avail: NTIS CSCL 09/2

PIPS is an Interactive Computer Graphics program for the calculation of the Properties of Irregular Parts Systems. This program uses the graphics terminal to determine the mass, weight, center of gravity, mass moments of inertia, products of inertia, principal axes and center of percussion of assemblies of irregularly shaped parts (not necessarily touching nor in the same plane) with respect to an arbitrarily selected 3-axis coordinate system. The solids may either be drawn at the graphics screen, or described and read in on punched cards, or generated by attaching (and modifying) an existing file of parts. The inputted solids may be accumulated with other solids and their combined properties calculated. PIPS was written for the CDC 6500/1700/274 facility operating under Scope 3.4.1, IGS Version 2, employing 30 overlays and 46K octal of 60 bit words of storage. The program will be rewritten for the Tektronix 40XX storage tube terminals. GRA

N75-31765# Lincoln Lab., Mass. Inst. of Tech., Lexington.
HARDWARE FOR THE FERMAT NUMBER TRANSFORM
James H. McClellan 1 Apr. 1975 59 p refs
(Contract F19628-73-C-0002; DA Proj. 7X2-63304-D-215)
(AD-A009144; TN-1975-18; ESD-TR-75-149) Avail: NTIS CSCL 09/2

The design and implementation of a hardware Fermat Number Transform (FNT) is described. The arithmetic logic design is treated in detail and a new data representation for integers modulo a Fermat number is derived. Some results of filter implementation with the FNT are shown to illustrate the use of the hardware. Finally, the FNT is compared with the Fast Fourier Transform

(FFT) on the basis of hardware required for a pipeline convolver. GRA

N75-31766# Utah Univ., Salt Lake City. Dept. of Computer Science.
SORCERER'S APPRENTICE: HEAD-MOUNTED DISPLAY AND WAND Ph.D. Thesis
Donald Lee Vickers Jul. 1974 87 p refs
(Contract F30602-70-C-0300)
(AD-A008787; UTEC-CSC-74-078) Avail: NTIS CSCL 09/2

Sorcerer's Apprentice is an interactive computer graphics system using a head-mounted display and a three-dimensional wand. The system allows three-dimensional interaction with line drawings which are displayed in real time, that is about 20 frames per second. The display, worn like a pair of eyeglasses, gives an illusion to the observer that he is surrounded by three-dimensional, computer-generated objects. The observer's view is continuously modified to compensate for his motion, allowing the objects to appear stationary as he walks among them. A hand-held wand lets the observer interact with the objects by touching them, moving them, changing their shapes, or joining them together. With the wand the observer can also create new objects and add to existing ones. The major activity described here dealt with communication from the observer to the computer. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-31767 Pittsburgh Univ., Pa.
SYSTEM DYNAMICS INTERACTIVE MODELS Ph.D. Thesis
Hrair Aldermeshian 1974 184 p
Avail: Univ. Microfilms Order No. 75-13644

The development of a computer precompiler in a high level computer language, such as FORTRAN, to effect a translation of a DYNAMO program to a FORTRAN program and to provide the necessary supporting routines to handle the model runs was reported. This translated program is an interactive one, that is, after compilation it will be possible to study the compiled model by changing initial conditions and plotting or printing different variables of the model without changing the original DYNAMO program and resubmitting it for a new pre-compilation. This interactive mode speeds turn around, reduces computation time and reduces core requirements, all obvious advantages especially for instructional purposes, as well as for research activities. Dissert. Abstr.

N75-31768 Kansas Univ., Lawrence.
MATHEMATICAL PROGRAMMING WITH MULTIFUNCTION CONSTRAINTS Ph.D. Thesis
David Joseph Thuente 1974 90 p
Avail: Univ. Microfilms Order No. 75-17688

Mathematical programs with uncertain multifunction constraints were considered. The possible range of values of various mathematical programs with inexact data under general assumptions were determined. Linear programs in which activity vectors are known only to be in specific though arbitrary constraint sets were examined. It was shown that the permanently feasible optimal solution can be obtained from standard linear programs. Linear programs were developed to determine the best possible optimal value. Duality theorems for generalized linear programs were formulated. Results were extended to demand and cost vectors and linearly constrained nonlinear programs. Applications to decision analysis and stochastic linear programming are given. A method was found for obtaining a linear program which yields the fat solution to stochastic linear programs when the activity vectors are independently constrained. The results were also applied to nonlinear programs, including nonlinear stochastic programs and chance constrained and joint chance constrained programs. Dissert. Abstr.

N75-31769*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GRAY-SHADING FOR THE SD-4060 GRAPHICS DEVICE
Christine Gloeckler Aug. 1975 29 p refs
(NASA-TM-X-70958; X-626-75-212) Avail: NTIS HC $3.75 CSCL 09B

Grays, a FORTRAN program, is described which will generate gray shading for the SD-4060 graphics device. The program produces 10 shades of gray ranging from no shading at all to complete coverage of the film frame. The graphing capabilities are summarized and illustrated. The figures displayed are representative of the microfilm output, but the distinction between various intensities is much clearer on the film, especially at the more intense shading. Author

N75-31770# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
ASYNCHRONUS LOGICAL COMMAND AND CONTROL SYSTEMS WITH CONCURRENT EVOLUTIONS Ph.D. Thesis - Toulouse Univ. [ETUDE DES SYSTEMES LOGIQUES DE COMMANDE ASYNCHRONES A EVOLUTIONS SIMULTANEES]
Marc Courvoisier 1974 164 p refs In FRENCH
(LAAS-Publ-1102) Avail: NTIS HC $6.25

A machine oriented language to describe command and control asynchronous systems with concurrent evolutions is presented. This language is used to construct algorithms to aid in the conception of logical systems. A systematic approach is carried out showing the generality of the method. Five examples are worked out. ESRO

N75-31771# Stuttgart Univ. (West Germany). Inst. fuer Informatik.
FACILITATION OF HYBRID COMPUTER USE BY PROBLEM-ORIENTED LEVEL PROGRAMMING [ERLEICHTERUNG DES EINSATZES HYBRIDER RECHENSYSTEME DURCH PROGRAMMIERUNG AUF PROBLEMORIENTIERTER EBENE]
H. Bannas, V. Hecht, B. Portugall, W. Reuss, and H. Rzehak 1973 66 p refs In GERMAN; ENGLISH summary
(IFI-03/73) Avail: NTIS HC $4.25

To program a hybrid system on a problem-oriented level it is necessary to use a complete programming system able to perform several services. The requirements for a hybrid source language are illustrated on the basis of a continuous system simulation language-compatible language. For the translation of the source language a technique is proposed, which is realized in some successive steps. A special point deals with questions of an automatic division of a given problem between the analogue and the digital part of a hybrid system. The basic problem is transformed into a standard form, for which an optimizing algorithm is developed. The concept of an autopatch system is represented including a program, which realizes the automatic connection of the computing circuit on the patch board. Author (ESRO)

N75-31772# Stuttgart Univ. (West Germany). Inst. fuer Informatik.
THE FORMAL SEMANTICS OF OPERATING SYSTEMS
E. J. Neuhold 1973 9 p refs Presented at the Intern. Computing Symp., 1973 Submitted for publication
(IFI-04/73) Avail: NTIS HC $3.25

A number of modifications to the Vienna Definition Language are discussed which allow the formal description of operating system features, like the concepts of parallelism and information sharing, and the formal definition of abstract interpreters working in a multiprocess environment. Using a very restricted abstract system it was possible to represent the protection ring concept, independent from all the other mechanisms of the system. However, the formal description identifies the other concepts which are closely related to protection rings, e.g. the construction of multiple virtual memories, the coordination of shared storage accesses, and also the precise handling of authorization errors in the system. Author (ESRO)

N75-31773# Stuttgart Univ. (West Germany). Inst. fuer Informatik.
STOCHASTIC OPTIMIZATION METHODS AND THEIR

VALUE FOR EXPERIMENTING WITH COMPUTING SYSTEMS
Brigitte Baumeister and Heinz Beilner 1974 29 p refs
(IFI-02/74) Avail: NTIS HC $3.75

Improving or optimizing the performance of a computing system means changing the system's structure and/or the values of the system's parameters so as to meet certain prespecified performance goals. If no analytic model of the total system is available, these changes have to be based upon the results of experiments with the computing system itself or with a suitable simulation model of the computing system. With respect to changing system parameters, the task of optimizing system performance via controlled experimentation is identical with the problem of optimizing a stochastic (performance-) function. Some statistical theorems on iterative, stochastic approximation are drawn together and their usefulness for actual experimentation problems is examined onthe basis of a selected set of hypothetical test pages. Author (ESRO)

N75-31774# Stuttgart Univ. (West Germany). Inst. fuer Informatik.
SPECIFICATION AND PROVING OF COMMAND PROGRAMS
E. J. Neuhold and T. Weller 1975 32 p refs
(IFI-01/75) Avail: NTIS HC $3.75

A method is described by which command languages can be specified in a precise and comprehensive way and by which the correctness of command programs can be proved automatically. The described technique is based on an abstract command processor (ACP) which was developed from principles of abstract interpreters and axiomatic definitions. A formal description of a sample command language (SCL) is given by identifying in an axiomatic manner the set of ACP state transformations arising during the execution of the commands and by defining interpretatively which of these transformations are chosen in a given context. Using this definition the correctness of a command program can be proved in a nonheuristic manner. The method is demonstrated with an SCL example. Author (ESRO)

N75-31775# Stuttgart Univ. (West Germany). Inst. fuer Informatik.
A PROBLEM-ORIENTED INPUT PROCESSOR SUPPORTING PROBLEM SOLVING
Wolfgang Glatthaar 1975 8 p refs
(IFI-02/75) Avail: NTIS HC $3.25

An interface module between user and computer program is defined on the basis of the psychology of thinking. The aim is to make the program available to any user familiar with the terms of his problem and to assist him in the choice of the solution without his prior knowledge of the program. The user is thus guided by the program in an analysis of his problem. This analysis is performed by a dialog which ensures that the initial conditions of the program are true. A description language for this model is defined. In this language the programmer provides the information necessary for a didactically good dialog. A component of all operating systems which perform the dialog for all programs is outlined. Author (ESRO)

N75-31776# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Operations Research.
DESIGN AND TESTING OF A GENERALIZED REDUCED GRADIENT CODE FOR NONLINEAR OPTIMIZATION
Leon S. Lasdon, Allan D. Waren, Arvind Jain, and Margery W. Ratner Mar. 1975 48 p refs
(Contract N00014-75-C-0240)
(AD-A009402; TM-353) Avail: NTIS CSCL 12/2

Generalized Reduced Gradient (GRG) Methods are algorithms for solving nonlinear programs of general structure. An earlier paper discussed the basic principles of GRG and presented the preliminary design of a GRG computer code. This paper describes a modified version of that initial design, including the experiences that led to the modifications. This paper also is intended to serve as partial system documentation. The code is compared computationally with an interior penalty function code, and anticipated future work on the algorithm is outlined. GRA

N75-31777# Technion - Israel Inst. of Tech., Haifa. Dept. of Computer Science.
MACRO PROCESSOR FOR EFFICIENT PROGRAM PRODUCTION Final Report, May 1973 - Apr. 1974
Apr. 1974 19 p refs
(Contract DAJA37-73-C-3009)
(AD-A009053) Avail: NTIS CSCL 09/2

The usefulness of a macro based Extensible Programming System (EPS) was evaluated experimentally. The ratio between the costs of solving a problem using assembly and an EPS implemented problem oriented language was measured. The costs of implementation of the special purpose language were high, but justifiable when high usage is expected. The process of language implementation with EPS was analyzed through 4 x 2 implementations of a subset of the COURSEWRITER language using both EPS and PL/1. EPS proved considerably more fitted than PL/1 for this purpose. The principal bottleneck in the use of EPS is the primitive macro time language, which is typical for current macro systems. In the experiments, the effect due to the differences between the abilities of the participants was avoided by comparing the time that the same person used with different systems. With these techniques, however, time measured for the system used first includes problem learning. This bias was to some extent corrected with a technique based on the mathematical model employed. The techniques developed for comparing programming systems were not completely satisfactory but seem to deserve a further development. GRA

N75-31778*# Hawaii Univ., Honolulu.
RESEARCH IN THE ALOHA SYSTEM Final Technical Report, 11 Oct. 1974
Norman Abramson 11 Oct. 1974 53 p refs
(Contract NAS2-6700; ARPA Order 1956)
(NASA-CR-143461; AD-A008865) Avail: NTIS HC $4.25 CSCL 09/2

The Aloha system was studied and developed and extended to advanced forms of computer communications networks. Theoretical and simulation studies of Aloha type radio channels for use in packet switched communications networks were performed. Improved versions of the Aloha communications techniques and their extensions were tested experimentally. A packet radio repeater suitable for use with the Aloha system operational network was developed. General studies of the organization of multiprocessor systems centered on the development of the BCC 500 computer were concluded. Y.J.A.

N75-31779# Mitre Corp., Bedford, Mass.
REMOTE-TERMINAL EMULATOR (DESIGN VERIFICATION MODEL). VOLUME 8: DESCRIPTION OF HARDWARE
E. C. DeMone Feb. 1975 75 p refs
(Contract F19628-75-C-0001; AF Proj. 572D)
(AD-A009146; MTR-2677-Vol-8; ESD-TR-75-55) Avail: NTIS CSCL 09/2

The Remote-Terminal Emulator is a minicomputer-based system which generates message traffic for use in testing and evaluating large-scale multi-terminal computer systems. This series of reports describes the two Design Verification Models that were developed on Data General NOVA 800 minicomputers. This volume describes the hardware for the fixed-site and on-site emulators, with emphasis on the special purpose components developed for the emulator application. Design and implementation details are presented to facilitate maintenance and repair of both systems, and to facilitate field modifications to the on-site system. GRA

N75-31780# Stanford Research Inst., Menlo Park, Calif.
TUTORIAL ON THE USE OF THE SRI TREE LANGUAGE SYSTEM
Ramon M. Zamora and Ellen B. Leaf Dec. 1974 146 p refs
(Contract MDA903-74-C-0240)
(AD-A008927) Avail: NTIS CSCL 05/1

Solving complex decision problems sometimes requires using extensive, tree-like data structures to represent the relationships among the variables involved in the problem. Once generated, this structure must then be analyzed. Because it is an onerous task to generate and evaluate large trees by hand, the Decision Analysis Group of Stanford Research Institute (SRI) has developed computer software for working with large decision trees, probability trees, and other tree-like data structures. This manual provides a tutorial presentation of the language SRI has developed for

describing and analyzing trees. In addition, it explains how to use CTREE, a program that can translate the tree language into FORTRAN programs. STD, a program designed to evaluate trees, is also described. Both CTREE and STD are available on several time-shared computer utilities. The manual emphasizes decision trees and probability trees. However, the user can develop, generate and evaluate any tree-like structure, using the basic tree language described here. GRA

N75-31781# Stanford Research Inst., Menlo Park, Calif.
SOFTWARE DEVELOPMENT FOR DECISION ANALYSIS. TASK B: PUBLICATION
Allen C. Miller, III 19 Mar. 1975 6 p
(Contract MDA903-74-C-0240; DARPA Order 2742; SRI Proj. 3309)
(AD-A008875) Avail: NTIS CSCL 05/1

This report deals with the accomplishments related to the following objectives: Transfer the existing SRI CTREE programs to a DARPA designated computer; provide a training session on the system for interested users; and produce a user publication on how to use and access the system. GRA

N75-31782# Stanford Research Inst., Menlo Park, Calif.
SOFTWARE DEVELOPMENT FOR DECISION ANALYSIS Semiannual Technical Report, 1 Dec. 1974 - 1 Mar. 1975
Allen C. Miller, III, Ronald A. Howard, James E. Matheson, Miley W. Merkhofer, and Thomas R. Rice 1 Mar. 1975 230 p refs
(Contract MDA903-74-C-0240; DARPA Order 2742; SRI Proj. 3309)
(AD-A008845) Avail: NTIS CSCL 09/2

This report summarizes the progress to date on morphology definition. It consists of three sections. Section 1 describes the research program to develop a system of computerized aids for decision analysis. Section 2 of the report deals with the fundamental components of a decision morphology, the analytical and communicative processes that are needed to analyze the broad range of decision problems. Section 3 presents an illustrative implementation of the morphology. The graphical algebraic technique described is the precursor to an automated system for decision making and is envisioned as one of its fundamental components. GRA

N75-31783# Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering and Management Sciences.
A HANDBOOK OF GEOMETRIC PROGRAMMING Interim Report
Elmor L. Peterson 15 Jul. 1974 88 p refs
(Grant AF-AFOSR-2516-73; AF Proj. 9749)
(AD-A008840; AFOSR-75-0550TR; Paper-101) Avail: NTIS CSCL 12/2

The purpose of this report is to summarize the present state-of-the-art in geometric programming and to indicate some of the directions in which it is moving. With respect to the major advances in theory, computation, and application made in recent years, this report will address only the fundamental aspects of the subject. An introduction to geometric programming, problem formulations and examples, and the basic theory for both the unconstrained and constrained optimization cases are presented, together with a list of pertinent references. GRA

N75-31784# Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering and Management Sciences.
TRAFFIC EQUILIBRIA ANALYSED VIA GEOMETRIC PROGRAMMING Interim Report
Michael A. Hall (Bell Telephone Labs., New Brunswick, N. J.) and Elmor L. Peterson Feb. 1975 59 p refs Presented at Intern. Symp. on Traffic Equilibrium Methods, Montreal, 21-23 Nov. 1974
(Grants AF-AFOSR-2516-73; NSF GU-3851C; AF Proj. 9749)
(AD-A008819; AFOSR-75-0549TR; Paper-130) Avail: NTIS CSCL 12/2

The traffic-assignment problem consists of predicting Wardrop-equilibrium flows on a roadway network when origin-to-destination input flows are specified. The demand-equilibrium problem consists of predicting those input flows that place the network in a state of economic equilibrium when the input flows are related via given travel-demand (feedback) curves to the resulting Wardrop-equilibrium origin-to-destination travel costs. The traffic-assignment problem is treated as a special cast of the demand-equilibrium (the case in which the travel-demand curves are graphs of constant functions); and the demand-equilibrium problem is formulated and studied in the context of (generalized) geometric programming. In particular, existence, uniqueness and characterization theorems are obtained via the duality theory of geometric programming by introducing appropriate extremality conditions and their corresponding dual variational principles (sometimes called complementary variational principles). These dual variational principles and extremality conditions also lead to new computational algorithms that show promise in the analysis of relatively large networks (such as those in relatively large urban or metropolitan areas). GRA

N75-31785# Softech, Inc., Waltham, Mass.
PROGRAM STRUCTURING PRINCIPLES FOR AUTOMATIC TEST EQUIPMENT SUPPORT AND APPLICATION SOFTWARE Final Report, 8 Mar. - 8 Sep. 1974
John B. Goodenough Apr. 1975 134 p refs
(Contract DAAA25-74-C-0469; DA Proj. 1G6-63622-AJ-29)
(AD-A009528; Rept-1014-1; FA-FCF-4-75) Avail: NTIS CSCL 09/2

This report deals with program structuring issues and language features supporting the development of well-structured automatic test equipment software. The main body of the report summarizes current and previous research findings, placing them in perspective for use in developing programs for testing and diagnosing Army materiel. Three Appendices present specific research findings. The first Appendix discusses what software reliability is and how it is related to program correctness, robustness, and fail-safe operation. The second Appendix describes a method for evaluating the complexity of a module in terms of the number of combinations of conditions relevant to its correct operation. A third Appendix discusses what exception conditions are, the requirements exception handling language features must satisfy, existing approaches to exception handling, and new language features for dealing with exceptions in an orderly and reliable way. GRA

N75-31786# Syracuse Univ., N.Y. Dept. of Industrial Engineering and Operations Research.
TIMING FIGURES FOR INVERTING LARGE MATRICES USING THE STARAN ASSOCIATIVE PROCESSOR Phase Report, Jan. - Dec. 1974
P. B. Berra and A. Singhania Mar. 1975 59 p refs
(Contract F30602-72-C-0360)
(AD-A009643; RADC-TR-75-73) Avail: NTIS CSCL 09/2

The overall purpose of this research project is to investigate the feasibility of solving a system of linear equations using an associative processor. The special consideration here is that the system will be very large, perhaps on the order of 2000 to 3000 unknowns. This report is concerned with the first phase of the research, that of developing timing figures for the inversion of the A matrix through Gauss Elimination using the STARAN architecture. The inversion of the full A matrix is a conservative approach but will yield upper bound results which are of importance in this feasibility study. Other methods will be considered in the future. GRA

N75-31787# Massachusetts Inst. of Tech., Cambridge. Operations Research Center.
A CUTTING PLANE METHOD FOR THE FIXED COST PROBLEM
Jean-Marc Rousseau Mar. 1975 213 p
(Contract DAHC04-73-C-0032; AROD Proj. P-9239-M)
(AD-A009783; TR-108) Avail: NTIS CSCL 12/2

The fixed cost linear programming problem (FCLP) refers to a linear programming problem in which each variable incurs a fixed cost or charge, in addition to its linear cost, whenever the variable takes a strictly positive value. The study is devoted to the development of a cutting plane method and its role in the perspective of a general framework (essentially a branch-and-bound) for FCLP algorithms. Analysis of the structure and properties of the problem reveals that algorithms which seek local minimum points (minimum with respect to neighborhood) are almost certain to be non-effective because of the proliferation of these local minima. The cutting plane method developed here (the FCLP cut) comes as the generalization, for the non-convex case, of outer linearization methods used for convex

problems. The FCLP cut is developed from a linear under approximation of the FCLP objective function. Convergence properties of the method are studied in depth and sufficient conditions for convergence to a global optimal solution are identified. The most interesting fact is the constructive similarity demonstrated between the Benders and FCLP cuts; they differ only by the space in which they are derived. GRA

N75-31788# Naval Surface Weapons Center, Dahlgren, Va.
COMPUTER PROGRAM FOR NETWORK FLOW PROBLEMS
Doily E. Fulcher and Eleanor J. Bailey May 1975 29 p refs
(AD-A009795; NSWC/DL-TR-3325) Avail: NTIS CSCL 12/2

The report describes a computer program designed to solve the following network flow problems: maximal flow, shortest route, and minimal cost maximal flow. The information necessary to use the program is given as well as input and output of a sample problem. The solution procedure and the computer respresentation of the network are discussed. A FORTRAN 4 listing of the program as run on the CDC 6700 computer is also presented. GRA

N75-31789# Naval Research Lab., Washington, D.C.
A PROGRAM FOR PLOTTING AN ANNOTATED TRACK Final Report
Marilyn L. Blodgett and James V. Massingill 31 Mar. 1975 48 p
(ARPA Order 1787; NRL Proj. SO1-47; ZF5255201)
(AD-A009770; NRL-7863) Avail: NTIS CSCL 09/2

A program has been written for plotting an annotated track on a polar stereographic projection. The program reads the date, navigation, bathymetry, and magnetics, from a magnetic tape in BCD form. The data is annotated every nth point. Navigation is annotated with fix numbers, bathymetry with uncorrected fathoms, meters, and corrected meters, and the magnetics with the residual magnetic intensity. This program enables the user to plot oceanographic parameters in relationship to their geographical position. The polar stereographic projection was used because great circles appear as straight lines and because it has very little distortion in the high latitudes. The program was written in FORTRAN 4 for use on the CDC 3800; however the program can be converted to read on other systems with little difficulty. GRA

N75-31790# Naval Research Lab., Washington, D.C.
A PROGRAM FOR STORING OCEANOGRAPHIC DATA ON MAGNETIC TAPE Final Report
Marilyn L. Blogett and James V. Massingill 31 Mar. 1975 50 p
(ARPA Order 1787; NRL Proj. SO1-47; ZF5255201)
(AD-A009798; NRL-7861) Avail: NTIS CSCL 09/2

A program has been written for the storage of navigation, bathymetry, and magnetics data on magnetic tape in BCD form. This eliminates the problem of storing vast amounts of data collected on computer cards by oceanographic and geophysical cruises. This program uses a slightly modified format recommended by the National Research Council of the National Academy of Sciences. The program was written in FORTRAN 4 for use on the CDC 3800; however the program can be converted to run on other systems with littly difficulty. GRA

N75-31791# Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.
AUTOMATIC COMPUTER PROGRAM GENERATION FOR AUTOMATIC TESTING SYSTEMS (ATS) Final Report
Noah S. Prywes Jan. 1975 120 p refs
(Contract DA-35-034-ORD-3347)
(AD-A009504; Rept-75-05; FA-FCF-3-75) Avail: NTIS CSCL 09/2

This is a report of an investigation of automatic computer program generation for Automatic Test Equipment. The feasibility of replacing human programmers by an automatic process is demonstrated through description and design of a language and a processor for this purpose. The system is referred to as NOPAL, an acronym for Nonprocedural Operational Performance Analysis Language. The report consists of five sections: Introduction, Major Sections of the Test Specification Language, Test Module Specification Language, Automatic Sequencing of Tests, and Conclusions and Recommendations. GRA

N75-31792# Ballistic Research Labs., Aberdeen Proving Ground, Md.
PROJECT SHALMANZAR UTILITY ROUTINES AND PROGRAMS FOR UNIVAC 1108 USERS
Thomas F. Erline Mar. 1975 56 p refs
(DA Proj. 1T6-62618-AH-80)
(AD-A009486; BRL-1769) Avail: NTIS CSCL 09/2

Project Shalmanzar is a collection of utility routines available on the UNIVAC 1108 at APG-EA. This manual gives examples for use of these routines. GRA

N75-31793# Mitre Corp., Bedford, Mass.
A SOFTWARE VALIDATION TECHNIQUE FOR CERTIFICATION: THE METHODOLOGY, VOLUME 1
D. E. Bell and E. L. Burke Apr. 1975 39 p refs
(Contract F19628-75-C-0001; AF Proj. 522B)
(AD-A009849; MTR-2932-Vol-1; ESD-TR-75-54-Vol-1) Avail: NTIS CSCL 09/2

Certification is the approval, by some appropriate authority, that a system meets some functional criteria. In the past, critical software systems, such as security controls have not been certifiable because of the unavailability of a formal validation technique. This paper establishes such a formal methodology for validating the correctness of a software system. The methodology is both rigorous and general and is suitable for certifying the effectiveness of software security controls that are to be used in an open environment. A companion volume will develop a detailed example based on a security kernel for a PDP-11/45. GRA

N75-31794# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
SET PARTITIONING
Egon Balas and Manfred Padberg Aug. 1974 70 p refs
(Contract N00014-67-A-0314-0007)
(AD-A009870; RR-351) Avail: NTIS CSCL 12/2

This paper discusses the set partitioning or equality-constrained set covering problem. It is a survey of theoretical results and solution methods for this problem. Part 1 gives some background material. Part 2 deals with structural properties of the set packing and set partitioning polytopes. Part 3 focuses on algorithms. GRA

N75-31795# Michigan Univ., Ann Arbor. Systems Engineering Lab.
A PROPOSAL FOR A PROGRAMMING LANGUAGE FOR PARALLEL PROCESSING ENVIRONMENTS Interim Report, Jul. 1972 - Jan. 1975
Keki B. Irani Feb. 1975 103 p refs
(Contract F30602-73-C-0001)
(AD-A009641; RADC-TR-75-63) Avail: NTIS CSCL 09/2

This report describes a proposal for a programming language designed for parallel processing environments. The proposed language has the advantage of preserving the programming concepts of sequential languages. Parallelism in execution is achieved by means of translating the programs to single assignment form. This task is performed by the compiler and is transparent to the programmer. The proposed language is the result of a minimum set of restrictions on and a minimum set of modifications to a higher level block-oriented language for making the translation to single assignment form feasible. GRA

N75-31796# Naval Postgraduate School, Monterey, Calif.
AN IMPLEMENTATION OF AN ITERATIVE GLOBAL FLOW ANALYSIS ALGORITHM M.S. Thesis
Jack William Cowan Mar. 1975 290 p refs
(AD-A009570) Avail: NTIS CSCL 09/2

Kildall has stated a general data flow analysis algorithm which has been applied to several forms of classical global program optimization. The algorithm operates upon the flow graph of a program, where the nodes correspond to basic blocks and the edges represent possible program control flows. In order to test the effectiveness of this algorithm, a general purpose optimizing module was written in XPL which analyzes ALGOL-E

programs for constant computations, common subexpressions and simplifying formal identities. Various node selection algorithms were investigated with respect to the convergence rate of the algorithm. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N75-31797# National Physical Lab., Teddington (England). Div. of Computer Science.
AN AUTOMATIC TERMINAL SIMULATING USER FUNCTION ON A LARGE MULTI-ACCESS COMPUTER
K. D. Dietz (Edinburgh Reg. Computer Centre) and C. R. Evans Jul. 1974 12 p
(NPL-Com-75) Avail: NTIS HC $3.25

An Automatic User Terminal System (ATS) which simulates a user of a multi-access system was designed. The purpose of ATS is to quantify the factors which contribute to multi-access system use efficiency. These include system availability, command response time, terminal printing speed, communication errors, and in session crash frequencies. The hardware used to provide an ATS facility for the ICL 4/75 EMAS system with a PDP 8 processor is illustrated and its software is described. The ATS which is used as a PDP 8 EMAS performance monitor can also be used as a normal terminal but with automatic sign-on. ESRO

N75-31798# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
INTERFACE MESSAGE PROCESSORS FOR THE ARPA COMPUTER NETWORK Quarterly Technical Report, 1 Oct. - 31 Dec. 1974
Frank E. Heart Jan. 1975 38 p
(Contract F08606-73-C-0027; ARPA Order 2351; AF Proj. 2351)
(AD-A008842; BBN-2988; QTR-8) Avail: NTIS CSCL 09/2

The ARPA computer network is a packet switching store-and-forward communications system designed for use by computers and computer terminals. This report concentrates on the new Pluribus IMP design; in particular on those aspects of the design which make a highly reliable system. Both the multiprocessor hardware and the software which operates on it include a large number of features designed to insure reliable operation. The design is applicable to a much broader set of uses than the IMP algorithm. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N75-31799 Purdue Univ., Lafayette, Ind.
SYNTACTIC DECODING FOR COMPUTER COMMUNICATION AND PATTERN RECOGNITION Ph.D. Thesis
Lai-Wo Fung 1974 107 p
Avail: Univ. Microfilms Order No. 75-17200

The problem of communicating linguistic messages over a noisy channel, where the messages have syntactic structures, and these can be computer programs or instructions communicated in a computer network, was dealt with. These messages are described as languages generated by formal context-free grammars. Channel coding is discussed and the so-called syntactic decoders are designed to correct errors caused by the memoryless binary symmetric noisy channel. Simulations were carried out which show that the syntactic decoder reduces the probabilities of erroneous decoding several times. The syntactic classification problem for noisy patterns was also studied. An error mechanism which involves three types of error transformations, namely, insertion, deletion and substitution, is assumed to corrupt patterns generated by the grammars for the classes. Simulation results show that the present error correcting syntactic classifier can make existing syntactic classifiers more effective in classifying noisy patterns. Dissert. Abstr.

N75-31800# Systems Control, Inc., Palo Alto, Calif.
MODEL STRUCTURE DETERMINATION AND IDENTIFIABILITY PROBLEMS IN SYSTEM IDENTIFICATION Annual Report
Edison Tse and Narendra Gupta Apr. 1975 50 p refs
(Contract N00014-72-C-0327)
(AD-A009404) Avail: NTIS CSCL 12/1

System identification has become one of the most active areas in system theory and its applications. In many engineering applications where the system to be identified or estimated is governed by differential or difference equations with known structure, the problem is mainly that of parameter estimation. As the authors extend the concept of system identification to those classes of problems where prior knowledge on structure is limited, some basic problems other than parameter estimation become important. System identification consists of three basic sub-problems: (1) pre-estimation, where one is concerned with structure specification, types of data to be collected, and experimental design, (2) estimation, where the main emphasis is on estimation algorithm development, and (3) post-estimation, where one has to test the validity of using the model for a specific objective. The program of studies reported here is on the basic problem in system identification, with more emphasis on pre-estimation and post-estimation problems. GRA

N75-31801# Brown Univ., Providence, R.I. Center for Dynamical Systems.
INTERNATIONAL SYMPOSIUM ON DYNAMICAL SYSTEMS Abstract of Contributed Papers
J. P. LaSalle 1974 42 p refs Conf. held at Providence, 12-16 Aug. 1974
(Grant AF-AFOSR-2686-74; AF Proj. 0769)
(AD-A009224; AFOSR-75-0604TR) Avail: NTIS CSCL 12/1

This publication contains the abstracts of contributed papers presented at the International Symposium on Dynamical Systems held August 12-16, 1974 at Brown University, Providence, R.I. The abstracts are listed alphabetically by the last name of the author presenting the paper. A proceedings of the Symposium will be published by Academic Press, New York, and will contain the invited addresses and a selected number of contributed papers. GRA

N75-31802# California Univ., Los Angeles. Computer Science Dept.
EXPERIMENTS ON PICTURE REPRESENTATION USING REGULAR DECOMPOSITION Interim Report
A. Klinger and C. R. Dyer Dec. 1974 92 p refs
(Grant AF-AFOSR-2384-72; AF Proj. 9769)
(AD-A008859; UCLA-ENG-7494; AFOSR-75-0553TR) Avail: NTIS CSCL 09/2

The problem of building a computer-searchable data representation for a complex image and the effect of representation on algorithms for scene segmentation into regions is considered. A regular decomposition of picture area into successively small quadrants is defined which involves logarithmic search. This hierarchial search and resulting picture representation is shown to enable rapid access of image data without regard to position, efficient storage, and approximate structural descriptions of constituent patterns. Examples involving solid geometrical objects, alphabetic characters and abstract patterns are given. GRA

N75-31803# Texas Univ., Austin. Center for Cybernetic Studies.
VECTOR LATTICES AND PIECEWISE-LINEAR PROGRAMMING
Mar. 1975 10 p refs
(Contract N00014-75-C-0569; NR Proj. 047-021)
(AD-A009396; CCS-217) Avail: NTIS CSCL 12/2

This paper exhibits a relationship between mathematical programming and the theory of vector lattices. In particular, for piecewise linear (not necessarily convex) programming a free vector lattice condition is shown to imply an equivalence to a linear programming problem. An extension to functions merely

positively homogeneous is made as well as a vector lattice analog of the Farkas-Minkowski Theorem. GRA

N75-31804# University of Southern Calif., Los Angeles. Image Processing Inst.
THE ROLE OF TEXTURE IN COMPUTERIZED SCENE ANALYSIS Ph.D. Thesis
William Baker Thompson Dec. 1974 104 p refs
(Grant DA-ARO(D)-31-124-72-G200; AROD Proj. 10708-RT)
(AD-A009793; USCIPI-550; ARO-10708.5-EL) Avail: NTIS CSCL 09/2

An important aspect of image interpretation is the segmentation of a scene into regions corresponding to objects in the scene. The need is demonstrated for incorporating textural information processing capabilities into scene segmentation systems. Visually distinct textural discontinuities often correspond to object boundaries in an image. Such discontinuities may be recognized as adjacent image regions differing significantly in some visually identifiable property. A perceptual distance function is developed which estimates the perceived dissimilarity between two image regions. This model is structured to make use of multiple, often redundant, and occasionally contradictory elementary measurements about the nature of the regions involved. In addition, the problem of determining the size of regions over which textural measurements are to be made in a scene analysis system is investigated. A method is proposed for bounding this region size based on information about human textural resolution. Experimental results are presented which demonstrate the success of the analysis techniques. GRA

N75-31805# Raytheon Co., Wayland, Mass. Equipment Div.
HYBRID IMAGE PROCESSING SYSTEM (HIPS) USER'S INSTRUCTION MANUAL AND PROGRAM DOCUMENTATION
A. Bay and R. Bright 31 Mar. 1975 201 p refs
(Contract N00014-74-C-0063)
(AD-A009818; Rept-53-AA-15-0702) Avail: NTIS CSCL 09/2

HIPS, or Hybrid Image Processing System, is a digital image handling system designed to accept images recorded on magnetic tape and to process and display them as commanded by an image analyst. The system is designated as hybrid because the input images may be derived by either digital or optical correlation of the signal histories. The system is interactive, meaning that the computer has been programmed in such a manner that its operations are conducted in a conversational mode where commands by the analyst are made through CRT terminal. The computer will respond to commands by querying the analyst for processing parameters, storage locations, and for additional operations. GRA

N75-31806# Rensselaer Polytechnic Inst., Troy, N.Y. Communication and Information Processing Group.
COINCIDENCE PROCEDURES FOR THE DETECTION OF KNOWN SIGNALS IN STATISTICALLY UNDERFINED BACKGROUND NOISE
James W. Modestino Feb. 1975 73 p refs
(Contract N00014-67-A-0117-0018; NR Proj. 375-971; RR0210501)
(AD-A009433; TR-1(1)) Avail: NTIS CSCL 09/4

Several classes of coincidence procedures are considered for the detection of known signals in additive signal-independent noise about which little statistical information is available, or can easily be obtained. The detection applications considered are of both the single channel and dual channel variety, the latter case including the situation where an independent reference channel is available as well as the dual channel test for the presence of a common-mode signal. The coincidence procedures under study are direct outgrowths of conventional optimum linear and/or quadratic filtering theory suggested by the robust performance of coincidence procedures in genral. In each of the detection applications under consideration, optimum coincidence procedures are defined directly analogous to their analog counter is given and the results of extensive computer simulations are included. Author

N75-31807# Illinois Univ., Urbana. Dept. of Computer Sciences.
LINDA (LINE DRAWING ANALYZER)
DickKent Blandford Jul. 1974 70 p refs
(Contract N00014-67-A-0305-0024)
(AD-A001382; UIUCDCS-R-74-668) Avail: NTIS CSCL 09/2

The LINDA system can be divided into three sub-systems. The first sub-system is small and contains about 15 integrated circuit packages. The function of this system is noise processing. The second sub-system in LINDA is the most important. It is the separation system and is responsible for separating the line drawing into its simpler parts and presenting these parts for analysis. The third sub-system in LINDA is the dictionary system. This system receives the separated video signal and does the analysis on it. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-31808 Florida Univ., Gainesville.
CENTRALIZERS OF INVOLUTIONS AND DOUBLY TRANSITIVE GROUPS Ph.D. Thesis
Karl J. Keppler 1974 37 p
Avail: Univ. Microfilms Order No. 75-16400

Recent investigations into doubly transitive permutation groups have focused much attention on the structure of the subgroups fixing two letters. Current 2-group methods empower the classification of doubly transitive groups in terms of the largest 2-group which can fix each of two letters; one such classification occurs here. Theorem A states that if G is a doubly transitive group of even degree on a set omega and, for alpha is not equal to beta has epsilon omega, G sub alpha beta has cyclic 2-Sylow subgroup, then G must be one of the rather small list of doubly transitive groups. The proof of Theorem A involves a fusion analysis, which in turn requires a Theorem B concerning the centralizer of a noncentral involution. The proof of Theorem B, however, leans on Theorem A. The seemingly circular reasoning has led to proving theorems A and B together by an induction argument, thereby resolving their mutual dependence. Dissert. Abstr.

N75-31809 Texas Univ., Austin.
GREEN'S FUNCTIONS ON SPHERES AND ON CLOSED ROBERTSON-WALKER SPACETIMES Ph.D. Thesis
Gerhard Ernest Hahne 1975 95 p
Avail: Univ. Microfilms Order No. 75-16680

The theory and computation of certain Green functions were investigated, with emphasis on their application toward the calculation of the rate of spontaneous creation of scalar particles by strong gravitational fields. The Green function for the Laplacian and the Helmholtz operators were first applied to the case of n-spheres, with a few examples worked out. Green functions were then obtained for massless particles in Einstein space-times of two and four dimensions. The conformally invariant equation in the case of the four-dimensional Einstein space was worked out in detail; this does not however predict any spontaneous creation of particles. A special kind of Green functions associated with the Klein-Gordon equation was related to the particle creation amplitude for an Einstein universe. Author

N75-31810 California Univ., Los Angeles.
FAULT DETECTION THROUGH PARALLEL PROCESSING IN BOOLEAN ALGEBRA Ph.D. Thesis
Donnamaie Eileen White 1975 157 p
Avail: Univ. Microfilms Order No. 75-16800

An overview of the research in progress on fault detection methods for circuits, both combinational circuits and sequential

explanation of Triadic Graph Theory is followed by a summary of the existing techniques for parallel processing in Boolean Algebra. Also treated is the extension of the applications of the Boolean Analyzer to the generation of: (1) Boolean Differences; (2) 'stuck-at' fault tests for a circuit (similar to those generated by Roth's D-Algorithm); and (3) the Test Sequence(s) of a circuit. Dissert. Abstr.

N75-31811 Florida Univ., Gainesville.
SOME NEW EXTENDED BLOCK DESIGNS AND THEIR ANALYSES Ph.D. Thesis
Jack Franklyn Schreckengost 1974 120 p
Avail: Univ. Microfilms Order No. 75-16444

An extended complete block design is a balanced block design consisting of t treatments in b blocks each size k such that k varies between t and 2t. The balance among the treatments is achieved by selecting duplicates of some of the treatments for each block according to the scheme followed when selecting blocks from the class of balanced incomplete block designs. A procedure for the test of the hypothesis of zero correlation is presented as is a method for estimating the correlation if the hypothesis of zero correlation is rejected in favor of the alternative hypothesis of positive correlation. Attention is given to the distribution of the sum of squares for remainder, where remainder is defined as residual minus duplication error, under the alternative hypothesis of positive correlation. The distribution of the sum of squares for remainder is necessary for calculating the power of the test and for obtaining an approximation to the distribution of the estimator of the correlation. Dissert. Abstr.

N75-31812 North Carolina State Univ., Raleigh.
EXPERIMENTAL DESIGNS FOR ESTIMATING THE SLOPE OF SECOND ORDER POLYNOMIAL RESPONSE SURFACES Ph.D. Thesis
Sung Hyun Park 1975 126 p
Avail: Univ. Microfilms Order No. 75-17109

Experimental designs for estimating the slope of second order polynomial response surfaces were investigated under the assumption that the true response in quadratic or cubic. For the case when the true model is quadratic the concept of the slope-rotatibility for an experimental design was introduced. This insures that the variance function of the estimated slope depends only on the distance from the origin of the design. Several second order slope-rotatable designs are presented. For the case when the true model is cubic, a criterion was developed to estimate the slope with minimum mean squared error integrated over a specified region of interest. A computer program was used to aid in the search for optimal designs in two independent variables. Optimal and near-optimal designs for the class of designs whose points are equally spaced on one, two, or three circles plus center points were constructed. Dissert. Abstr.

N75-31813 Massachusetts Univ., Boston.
MODEL REFERENCE ADAPTIVE SYSTEM DESIGN FOR MULTIVARIABLE PLANTS Ph.D. Thesis
Chang-Cheng Hsing 1975 87 p
Avail: Univ. Microfilms Order No. 75-16566

A model reference technique was employed for the desired dynamic behavior of the plant and was represented by a reference model. The control inputs associated with the adaptive parameters of the plant were continuously adjusted, so that its response duplicated that of the model as close as possible. The designs studied were ones in which feed-forward and feed-back gains were adjusted to compensate for unknown plant parameters in contrast to that in which plant parameters were adjusted directly. Liapunov's direct method was selected as the basis for synthesizing the adaptive laws for the multivariable plant. The main disadvantages of the Liapunov approach was eliminated, which was the need for plant output derivatives to implement the adaptive laws. Model reference adaptive techniques were also used to identify the dynamics of a multivariable plant where only the input and output signals were accessible. Since Liapunov's direct method was used to synthesize the identification algorithms, the identification procedure was always globally asymptotically stable. Dissert. Abstr.

N75-31814 Iowa State Univ. of Science and Technology, Ames.
SOME RATIO-TYPE ESTIMATORS BASED ON TWO OR MORE AUXILIARY VARIABLES Ph.D. Thesis
Lal Chand 1975 252 p
Avail: Univ. Microfilms Order No. 75-17383

The problem of estimating the population mean of the characteristic Y under study, when the population mean of the best auxiliary variable is not known but that of some other auxiliary variable correlated with Y is either available or information on it can be easily and cheaply collected, is considered. Four classes of estimators (1) chain-type ratio estimators, (2) almost unbiased ratio estimators, (3) unbiased ratio-type estimators analogous to the Hartley-Ross estimator, and (4) unbiased Lahiri-type ratio estimators are proposed. All of them either do not require the knowledge of the population means of the auxiliary variables being used or at the most require the knowledge of the population mean of only one auxiliary variable which occurs last in the chain. Generalized estimators using lambda auxiliary variables for all the four classes of estimators are presented. Most of the known ratio-type estimators turn out as special cases of these estimators. Dissert. Abstr.

N75-31815 State Univ. of New York, Stony Brook.
COMPUTATIONAL METHODS FOR A SOLVING LARGE LINEAR SYSTEMS Ph.D. Thesis
Andy Steve Kydes 1974 153 p
Avail: Univ. Microfilms Order No. 75-16197

Computational schemes are derived and examined for obtaining meaningful solutions from large linear systems of equations which may be inconsistent, ill-conditioned and/or rank deficient. Two principle approaches are used. The first utilizes the concept of the Moore-Penrose generalized inverse and Householder transformations to obtain a modified damped least squares solution. The modification has the property that the modified damped least squares solution continuously approaches the minimum 2-norm least squares solution as the value of the damping factor approaches zero. The Householder type modification to damped least squares solutions is employed in the doubly-relaxed generalized inverse approach to extend the results of Rutishauser and Joshi and Tewarson. The second principle approach redefines the concept of a 'solution' to an overdetermined set of inconsistent equations of rank 'k' as a vector which satisfied at least 'k' of the original equations, Ax = b. A local algorithm is derived and combined with globally convergent schemes to give a pseudo-Chebyschev solution. Dissert. Abstr.

N75-31816 Texas Univ., Austin.
DISCRETE POLYNOMIAL SPLINE APPROXIMATION METHODS Ph.D. Thesis
Tom Johan Wiborg Lyche 1975 121 p
Avail: Univ. Microfilms Order No. 75-16700

A class of piecewise polynomial functions, called discrete splines, are considered. These functions are spline functions where the ties between each polynomial involve continuity of differences rather than derivatives. Several discrete spline approximation methods were studied, and error bounds are derived. The usual error bounds for splines are only valid for rather smooth functions, and involve maximizing (or integrating) some high order derivative over an infinite number of points. In the discrete case no smoothness assumptions are needed, and the bounds involve maximizing (or summing) some high order difference at a finite number of points. The error bounds are formulated so that known results for the continuous case follow from the discrete results letting a discretization parameter equal to zero.
Dissert. Abstr.

N75-31817 Georgia Inst. of Tech., Atlanta.
EVOLUTION SYSTEM APPROXIMATIONS OF SOLUTIONS TO CLOSED LINEAR OPERATOR EQUATIONS Ph.D. Thesis
Seaton Driskell Purdom 1975 61 p
Avail: Univ. Microfilms Order No. 75-17492

With S a linearly ordered set with the least upper bound property, with g a nonincreasing real-valued function on S, and with A densely defined dissipative linear operator, an evolution system M is developed to solve the modified Stieltjes integral equation. An affine version of this equation is also considered. Under the hypothesis that the evolution system associated with the linear equation is strongly (resp. weakly) asymptotically convergent, an evolution system is used to strongly (resp. weakly)

approximate solutions to the closed operator equation Ay = -z.
Dissert. Abstr.

N75-31818 Florida Univ., Gainesville.
TENSOR PRODUCTS OF SPACES OF MEASURES AND VECTOR INTEGRATION IN TENSOR PRODUCT SPACES Ph.D. Thesis
Donald P. Story 1974 121 p
Avail: Univ. Microfilms Order No. 75-16452

Concepts of measure and integration are investigated within the framework of the topological tensor product of two Banach spaces. Basic existence theorems are given for the tensor product of two vector measures. The topological tensor product of certain spaces of measures is studied, where the space of all measures with Radon-Nikodym property and the space of all measures with relatively norm compact range are identified in terms of tensor products. Theory of integration of vector valued functions is discussed, with respect to a vector measure. The value of the integral is in the inductive tensor product of the range spaces, and the integral is a generalization of B. J. Pettis' weak intergal. Normed Pettis and Bochner-Lebesgue spaces are considered, and the Vitali and Lebesgue dominated convergence theorms are proved. Dissert. Abstr.

N75-31819 Missouri Univ., Columbia.
PREDICTOR AND CORRECTOR METHODS WITH INCREASED RANGES OF RELATIVE STABILITY Ph.D. Thesis
Sylvester Thompson 1974 79 p
Avail: Univ. Microfilms Order No. 75-16067

Relative stability characteristics of several classes of methods used in the solution of numerical initial value problems were investigated. The following classes of methods were first considered: (1) aP(q+1,q+1)+(1-a)C(q+1,q) and (2) aP(q+1,q+1)+(1-a)P(q,q). For both cases, a is real and 2(CH76)or=q(CH76)or=9. Also, P(q+1,q+1)(q=1,...,9) and C(q+1,q)(q=2,...,9) and the standard Adams-Bashforth predictor and Adams-Moulton corrector are of order q+1, respectively. Methods were found whose intervals of convergence contain the largest intervals of the form (-alpha,alpha) on which the given methods are relatively stable. Several other classes of fourth order methods were evaluated. The best methods from the class of (4,3) correctors were determined. The class of (4,4) predictors was then considered. Improved methods with large stability regions were found which allow the possibility of solving initial value problems using only a predictor method. Dissert. Abstr.

N75-31820*# Polytechnic Inst. of New York, Farmingdale. Dept. of Aerospace Engineering and Applied Mechanics.
HIGH-ORDER NUMERICAL SOLUTIONS USING CUBIC SPLINES Final Report, 1 Sep. 1974 - 31 Aug. 1975
S. G. Rubin and P. K. Khosla Aug. 1975 62 p refs
(Grant NsG-1091)
(NASA-CR-143440) Avail: NTIS HC $4.25 CSCL 12A

The cubic spline collocation procedure for the numerical solution of partial differential equations was reformulated so that the accuracy of the second-derivative approximation is improved and parallels that previously obtained for lower derivative terms. The final result is a numerical procedure having overall third-order accuracy for a nonuniform mesh and overall fourth-order accuracy for a uniform mesh. Application of the technique was made to the Burger's equation, to the flow around a linear corner, to the potential flow over a circular cylinder, and to boundary layer problems. The results confirmed the higher-order accuracy of the spline method and suggest that accurate solutions for more practical flow problems can be obtained with relatively coarse nonuniform meshes. Author

N75-31821*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A PARALLEL JACOBSON-OKSMAN OPTIMIZATION ALGORITHM
Terry A. Straeter and Athena T. Markos Washington Sep. 1975 19 p refs
(NASA-TN-D-8020; L-10044) Avail: NTIS HC $3.25 CSCL 12A

A gradient-dependent optimization technique which exploits the vector-streaming or parallel-computing capabilities of some modern computers is presented. The algorithm, derived by assuming that the function to be minimized is homogeneous, is a modification of the Jacobson-Oksman serial minimization method. In addition to describing the algorithm, conditions insuring the convergence of the iterates of the algorithm and the results of numerical experiments on a group of sample test functions are presented. The results of these experiments indicate that this algorithm will solve optimization problems in less computing time than conventional serial methods on machines having vector-streaming or parallel-computing capabilities. Author

N75-31822*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGHER ORDER ACCURATE PARTIAL IMPLICITIZATION: AN UNCONDITIONALLY STABLE FOURTH-ORDER-ACCURATE EXPLICIT NUMERICAL TECHNIQUE
Randolph A. Graves, Jr. Washington Sep. 1975 28 p refs
(NASA-TN-D-8021; L-10261) Avail: NTIS HC $3.75 CSCL 12A

The previously obtained second-order-accurate partial implicitization numerical technique used in the solution of fluid dynamic problems was modified with little complication to achieve fourth-order accuracy. The Von Neumann stability analysis demonstrated the unconditional linear stability of the technique. The order of the truncation error was deduced from the Taylor series expansions of the linearized difference equations and was verified by numerical solutions to Burger's equation. For comparison, results were also obtained for Burger's equation using a second-order-accurate partial-implicitization scheme, as well as the fourth-order scheme of Kreiss. Author

N75-31823# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
A STATISTICAL METHOD FOR ERROR REDUCTION IN AN INTEGRATION PROCESS INVOLVING EXPERIMENTAL DATA
T. J. Stahlie Jun. 1974 14 p refs Presented at the Symp. on Computational Statistics, Vienna, 2-6 Sep. 1974
(NLR-MP-74015-U) Avail: NTIS HC $3.25

The numerical integration of a nonlinear function with mutually independent variables is considered for the case wherein the initial conditions for the integration process and time series of the variables are determined by experiment. To minimize the error in the result of the integration process a technique was developed based on the stochastic characteristics of the measured variables. This technique was applied to the problem of determining aircraft trajectories from inflight recordings of acceleration components and attitude of the aircraft (Euler angles). Starting from given initial conditions for position and speed of the aircraft in addition to a measured end condition, a minimum error estimate of the trajectory is derived. Special attention was paid to the following aspects of the technique: a comparison to simple non-stochastic error reduction techniques, the effect of errors in the addition information on the resulting accuracies, and the validation of the technique. Author (ESRO)

N75-31824# Technology, Inc., Dayton, Ohio.
CHI-SQUARE GOODNESS OF FIT TESTS FOR STRONG MIXING STATIONARY PROCESSES Interim Report, Jun. - Aug. 1973
K. C. Chanda Jan. 1975 38 p refs
(Contract F33615-71-C-1463; AF Proj. 7071)
(AD-A008738; ARL-75-0016) Avail: NTIS CSCL 12/1

An attempt has been made in this report to investigate whether appropriate tests can be formulated to test the adequacy of various models about the univariate distribution of a strictly stationary process. Specifically, it is assumed that the strictly stationary process is strong-mixing, that the data derived from such a process is grouped and that the standard chi-squared tests based on the deviations of the observed from the expected frequencies for these groups are used. Asymptotic sampling properties of these tests for various types of simple and composite hypotheses about this univariate distribution have then been derived. GRA

N75-31825# California Univ., San Diego. Dept. of Mathematics.
A REMARKABLE INEQUALITY AND THE UNIFORM

CONVERGENCE OF FOURIER SERIES Interim Report
Adriano M. Garsia 1975 46 p refs
(Grant AF-AFOSR-2088-71; AF Proj. 9769)
(AD-A008726; AFOSR-75-0499TR) Avail: NTIS CSCL 12/1

The L sub p modulus of continuity of a nonperiodic function is discussed. An inequality is described which can be used to derive information as to the smoothness and integrability properties of 'f' from the behavior of Q sub p (beta, f) as beta approaches 0. Theorem proofs are included. M.J.S.

N75-31826# Clemson Univ., S.C. Dept. of Mathematical Sciences.
POLYNOMIALS OVER A RING WHICH PERMUTE THE MATRICES OVER THAT RING
Joel V. Brawley, Jr. 3 Sep. 1974 16 p refs
(Contract N00014-71-A-0339-0004; NR Proj. 044-475)
(AD-A009808; TR-181) Avail: NTIS CSCL 12/1

Let R denote a finite commutative ring with identity and let R sub (n x n) denote the nxn matrices over R. Each polynomial f(x) and element of R(in brackets:(x)) defines, via substitution a function from R sub (n x n) to R sub (n x n). In this paper necessary and sufficient conditions are given on a polynomial f(x) in order that it define a permutation of R sub (n x n). GRA

N75-31827# Clemson Univ., S.C. Dept. of Mathematical Sciences.
A NOTE ON SYMMETRIC MATRICES AND SIMILARITY
Joel V. Brawley, Jr. 30 May 1974 12 p refs
(Contract N00014-71-C-0339-0004; NR Proj. 044-475)
(AD-A009812; TR-2) Avail: NTIS CSCL 12/1

Symmetric matrices play a vital role in many areas of applied as well as pure mathematics. Examples include the areas of linear statistical models and the theory of quadratic forms. The theory of similarity of matrices also has many applications; for example, in differential equations, stochastic processes, and the solutions of matrix equations. Thus an interesting question which could prove to be of applied value is a question of the relationship of these two concepts: When is a square matrix A over a field F similar over F to a symmetric matrix; i.e., when does there exist a nonsingular matrix P over F such that P inverse AP is symmetric. In the present paper the author characterizes those fields F in which every square matrix over F is similar to a symmetric matrix. GRA

N75-31828# Clemson Univ., S.C. Dept. of Mathematical Sciences.
EQUIVALENCES OF VIGENERE SYSTEMS OVER FINITE GROUPS
Joel V. Brawley, Jr. and Jack Levine 20 May 1974 27 p refs
(Contract N00014-71-A-0339-0004; NR Proj. 044-475)
(AD-A009806; TR-177) Avail: NTIS CSCL 12/1

The classical Vigenere system for enciphering secret messages, named after Blaise de Vigenere (1523-1596), is well-known in cryptography. While a cryptogram enciphered by this method is readily solved by cryptanalysts, using such tools as probable words, repeated patterns and frequence analysis to construct a cryptographically equivalent system, it is interesting to study equivalence of Vigenere systems from a mathematical point of view. Such a study is the purpose of the present paper. GRA

N75-31829# Clemson Univ., S.C.
SIMILARITY TO SYMMETRIC MATRICES OVER FIELDS WHICH ARE NOT FORMALLY REAL
Edward A. Bender and J. V. Brawley, Jr. 16 Jun. 1974 16 p refs
(Contract N00014-71-A-0339-0004; NR Proj. 044-475)
(AD-A009807; TR-179) Avail: NTIS CSCL 12/1

It is shown that a matrix is similar to a symmetric matrix over a field of characteristic 2 if and only if the minimum polynomial of the matrix is not the product of distinct irreducible polynomials whose splitting fields are inseparable extensions. When the field is not characteristic 2, a known theorem is generalized by considering k, the number of elementary divisors of odd degree of the nxn matrix A: If -1 is a sum of (2 sup nu) squares and n differs from a multiple of 2 sup(nu - 1) by at most plus or minus k, then A is similar to a symmetric matrix. GRA

N75-31830# SKF Industries, Inc., King of Prussia, Pa.
INFERENTIAL TECHNIQUES FOR WEIBULL POPULATIONS Interim Report, 15 Apr. 1972 - 15 Apr. 1974
John I. McCool Dec. 1974 251 p refs
(Contract F33615-72-C-1761; AF Proj. 7071)
(AD-A009645; ARL-74-0180) Avail: NTIS CSCL 12/1

The theoretical basis is developed and tables are supplied for the conduct of multiple comparison hypothesis tests using maximum likelihood estimates, on the Weibull shape parameter and, under the assumption of common shape parameters, on a specific Weibull percentile, given k type II censored samples drawn from independent 2-parameter Weibull populations. A procedure is developed and appropriate tables are given for forming interval estimates for the Weibull shape parameter and a percentile of a 2-parameter Weibull primary failure mode when a competing Weibull failure mode having the same, (but unknown) shape parameter is operative. Several methods of approximating percentage points of the distribution of certain functions of the maximum likelihood estimates needed for interval estimation of the Weibull parameters are developed and their range of validity discussed. The exact distribution of the largest to smallest ML shape parameter estimates in k samples of size n, type II censored at r = 2 failures, is found and its asymptotic behavior for large n is discussed. Tables needed for calculating the OC curve of a one-sided test of the hypothesis that a Weibull percentile assumes a specified value are included. GRA

N75-31831# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
EVALUATION AND ANALYSES OF SOME FINITE ELEMENT AND FINITE DIFFERENCE PROCEDURES FOR TIME DEPENDENT PROBLEMS Final Report
C. S. Desai, J. T. Oden, and L. D. Johnson Apr. 1975 110 p refs
(AD-A009739; AEWES-Misc-Paper-S-75-7) Avail: NTIS CSCL 12/1

A large number of schemes using the finite element (FE) and finite difference (FD) methods have been proposed. Numerical and physical properties of these schemes, vital for their use as general procedures and significant from the viewpoint of the user, are often not examined adequately. One of the aims of this study was to examine numerical properties of a selected number of schemes for problems relevant to geotechnical engineering. GRA

N75-31832# Naval Postgraduate School, Monterey, Calif.
TWO APPROACHES TO INTEGRATION M.S. Thesis
Do Xuan Tho Mar. 1975 145 p refs
(AD-A009564) Avail: NTIS CSCL 12/1

This thesis investigates how to approach the theory of integration for use by the non-mathematician by exposing its essence and by considering integration theory from two different points of view. The first point of view is via linear functionals known as the Daniell development and the second point of view is via measure theory. GRA

N75-31833# Rocketdyne, Canoga Park, Calif.
A PREDICTION INTERVAL APPROACH TO DEFINING VARIABLES SAMPLING PLANS FOR FINITE LOTS REQUIRED TO BE OF HIGH QUALITY: SINGLE SAMPLING FOR GAUSSIAN PROCESSES
Kenneth W. Fertig and Nancy R. Mann 1 Feb. 1975 23 p refs
(Contract N00014-73-C-0474; NR Proj. 042-321)
(AD-A009866) Avail: NTIS CSCL 12/1

A prediction-interval approach and an assumption of a Gaussian manufacturing process are used to derive a variables sampling plan applicable to finite lots required to be of very high quality. Values tabulated for calculating acceptance regions are such that, with high probability, accepted lots will have zero defects. Further, tables are given for selecting sample size for a specified combination of lot size and acceptable quality level. Comparisons show that, for a fixed risk level, substantial savings in required sample size can be effected over those specified by comparable hypergeometric sampling plans. Lots ranging in size from 5 to 100 are considered. Bounds for the probability of accepting a lot with a fixed number of defects and coming from a prescribed manufacturing process are derived and prove

to be very tight. Not only are these bounds useful in defining the required sample size in the sampling plan context, but the method of derivation has application to other areas of sampling, e.g. from truncated or stratified distributions. GRA

N75-31834# Texas Univ., Austin. Center for Cybernetic Studies.
CONSTRAINED KULLBACK-LEIBLER ESTIMATION; GENERALIZED COBB-DOIGLAS BALANCE, AND UNCONSTRAINED CONVEX PROGRAMMING
A. Charnes and W. W. Cooper Jan. 1975 20 p refs
(Contract N00014-75-C-0569; NR Proj. 047-021)
(AD-A009394; CCS-167) Avail: NTIS CSCL 12/2

In this paper the authors characterize completely the relationships of (1) a more general case than Kullback-Leibler estimation with finite discrete distribution and linear inequality constraints, (2) unconstrained minimization of a convex potential, or neg-utility function and (3) generalized Cobb-Douglas equilibrium or accounting balance equations. An exact duality pair characterization of the relevant class of extended geometric programming problems is obtained in place of the weaker necessary or sufficient conditions of Duffin, Peterson, and Zener. A new class of entropic solutions for n-person characteristic function games is presented which has an equivalent unconstrained convex programming dual characterization. GRA

N75-31835# Texas Univ., Austin. Center for Cybernetic Studies.
CONTRIBUTIONS TO THE THEORY OF LOCAL EXTREMA
A. Ben-Tal Mar. 1975 30 p refs
(Contract N00014-75-C-0569; NR Proj. 047-021)
(AD-A009393; CCS-223) Avail: NTIS CSCL 12/2

The paper is concerned with the problems of characterizing a local minimum of a constrained mathematical programming problem. Some new and some old results are obtained from a basic principle which allow a unified treatment of both necessary and sufficient conditions. The theory developed is free of constraint qualification assumptions. Most of the second order results are given in primal and dual formulations. GRA

N75-31836# Texas Univ., Austin. Center for Cybernetic Studies.
ON GENERALIZED MEANS AND GENERALIZED CONVEX FUNCTION
A. Ben-Tal Apr. 1975 19 p refs
(Contract N00014-75-C-0569; NR Proj. 047-021)
(AD-A009392; CCS-224) Avail: NTIS CSCL 12/2

Properties of generalized convex functions, defined in terms of the generalized means introduced by Hardy, Littlewood and Polya, are easily obtained by showing that generalized means and generalized convex functions are in fact ordinary arithmetic means and ordinary convex functions, respectively, defined on linear spaces with suited chosen operations of addition and multiplication. The results are applied to some problems in statistical decision theory. GRA

N75-31837# Clemson Univ., S.C. Dept. of Mathematical Sciences.
A MONOTONICITY PROPERTY OF THE MULTIVARIATE NORMAL DISTRIBUTION
K. Alam 23 Jan. 1974 15 p refs
(Contract N00014-71-A-0339-0002; NR Proj. 042-271)
(AD-A009856; TR-164) Avail: NTIS CSCL 12/1

A monotonicity property of the function F(y: A sub 1,..., a sub p) = P(X sub 1 is greater than or equal to y with respect to X sub i is greater than or equal A sub i i = 1,...,P) is proved, where (X sub 1,..., X sub p) has a multivariate normal distribution. GRA

N75-31838# Clemson Univ., S.C. Dept. of Mathematical Sciences.
A BAYESIAN APPROACH TO A NONPARAMETRIC PROBLEM OF SELECTING THE POPULATION WITH THE LARGEST p-QUANTILE
K. Alam 12 Nov. 1974 19 p refs
(Contract N00014-71-A-0339-0002)
(AD-A009858; TR-190) Avail: NTIS CSCL 12/1

The problem of selecting which of k given distributions has the largest p-quantile was considered using a Bayesian approach, with prior distributions generated from a Dirichlet process. The probability of a correct selection is derived for a selection procedure for the given problem. Y.J.A.

N75-31839# Clemson Univ., S.C. Dept. of Mathematical Sciences.
COMPARISON OF SEVERAL ALGORITHMS FOR COMPUTING SAMPLE MEANS AND VARIANCES
R. Ling Jul. 1974 18 p refs
(Contract N00014-71-A-0339-0002; NR Proj. 042-271)
(AD-A009855; TR-161) Avail: NTIS CSCL 12/1

Several one-pass and two-pass algorithms for the computation of sample means and variances are compared by their performance on sets of randomly generated data and systematically generated data with random noise. The relation between the performance of each algorithm and the coefficient of variation of the population from which random data sets are generated is explored. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N75-31840 North Carolina State Univ., Raleigh.
STATISTICS FOR TESTING UNIFORMITY ON THE UNIT INTERVAL Ph.D. Thesis
Forest Leonard Miller, Jr. 1975 95 p
Avail: Univ. Microfilms Order No. 75-17107

The performance of nine test statistics in detecting certain types of non-uniformity on (0,1) is studied for small sample sizes. The types of non-uniformity considered (concentration of mass in the middle of the interval, one or both ends) is motivated by experience with the conditional probability integral transformation. The statistics evaluated are the discrete X(2) with 10 and 20 cells, the Kolmogorov-Smirnov D sub n, the Cramer-von Mises W(2), the Watson U(2), and Anderson-Darling A, the Greenwood G and two new statistics, constructed from sample spacings. The critical values of the G statistic and the two new statistics were obtained by Monte Carlo methods. A transformation proposed by Durbin as a way to improve power is studied. It is found that this transformation does not, in general increase power for the statistics mentioned for the families of alternative distributions considered. Dissert. Abstr.

N75-31841 Carnegie-Mellon Univ., Pittsburgh, Pa.
ANALYSIS OF ENSEMBLE PATTERNS Ph.D. Thesis
Tze-Shiu Liu 1975 210 p
Avail: Univ. Microfilms Order No. 75-17844

Analytical schemes through which the underlying pattern of a given ensemble can be revealed are derived. Since the enhancement of an appropriat3 scheme for pattern analysis is conditioned by the observation scheme of the ensemble, two major observation schemes are first defined: the discrete observation scheme and the stochastic observation scheme. Through these schemes, the discrete ensemble and the stochastic ensemble are generated respectively. Several sets of simulated and real-world data are used to exemplify the physical meaning of the proposed measures and to demonstrate the operational feasibility and significance of the methodologies for analyzing ensemble patterns. Dissert. Abstr.

N75-31842 Florida Univ., Gainesville.
ESTIMATING AND TESTING THE PARAMETERS OF A GENERALIZATION OF THE FIRST ORDER NONSTATIONARY AUTOREGRESSIVE PROCESS Ph.D. Thesis
Darryl Jon Downing 1974 98 p
Avail: Univ. Microfilms Order No. 75-16375

A stochastic process is represented as having two components: drift which measures location; and noise which measures the variability of the stochastic process. The noise process is estimated when the noise process is assumed to follow a generalized first order nonstationary autoregressive process. The generalized first order autoregressive process is defined similar to the first order autoregressive process, except that the parameter relating two observations is different for each time point. In

order to estimate these parameters it is necessary that the stochastic process be replicated a sufficient number of times. A method of estimating the parameters is proposed and the broad attendant distribution theory is delineated, both in a general setting and for specific situations. The properties of these estimators are given and some tests of hypothesis concerning the parameters are investigated. Maximum likelihood estimators are used. Their properties are given and a critical comparison is made between them and the proposed estimators.
Dissert. Abstr.

N75-31843 George Washington Univ., Washington, D.C.
SEVERAL NUMERICAL PROCEDURES IN REGRESSION AND PARAMETRIC ESTIMATION IN CONTINGENCY TABLES Ph.D. Thesis
John Carl Keegel 1975 68 p
Avail: Univ. Microfilms Order No. 75-18066

Chebyshev techniques that are used in finding optimal experimental designs are discussed and a general computer procedure together with a manual for its use is given. Examples of polynomial regression designs are given together with design tables. Three algorithms that converge to the m.d.i. estimates in contingency table analysis are considered. Their comparative advantages and disadvantages are given. Computer programs that implement these procedures are given together with a manual for their use.
Dissert. Abstr.

N75-31844 Purdue Univ., Lafayette, Ind.
PROBLEMS OF OPTIMAL SELECTION BASED ON RELATIVE RANK Ph.D. Thesis
Jacqueline Gianni 1974 77 p
Avail: Univ. Microfilms Order No. 75-17203

It is shown that generalization of the Secretary problem to infinitely many arrivals is in a sense the limit of the finite Secretary problem: i.e. the optimal payoffs converge to the optimal payoff for the corresponding infinite problem. Sufficient and necessary conditions are given for the finiteness of the limit. A finite problem is formulated in which the number of individuals is a random variable N. For a special class of random variables N, depending on n and such that E(N) approaches infinity as n approaches infinity it is shown that as n approaches infinity the minimal expected rank approaches infinity if alpha < 2, and approaches a finite quantity if alpha $>$ or $= 2$. It is proved that if alpha > 2 the limiting value is identifical to that for a known number of individuals, while if alpha $= 2$ it is finite but apparently larger.
Dissert. Abstr.

N75-31845*# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
ESTIMATION AND ANALYSIS OF NONLINEAR STOCHASTIC SYSTEMS Ph.D. Thesis
Steven I. Marcus Jun. 1975 159 p refs
(Grants NGL-22-009-124; AF-AFOSR-72-2273; NSF K-42090) (NASA-CR-143455; ESL-R-601) Avail: NTIS HC $6.25 CSCL 12A

The algebraic and geometric structures of certain classes of nonlinear stochastic systems were exploited in order to obtain useful stability and estimation results. The class of bilinear stochastic systems (or linear systems with multiplicative noise) was discussed. The stochastic stability of bilinear systems driven by colored noise was considered. Approximate methods for obtaining sufficient conditions for the stochastic stability of bilinear systems evolving on general Lie groups were discussed. Two classes of estimation problems involving bilinear systems were considered. It was proved that, for systems described by certain types of Volterra series expansions or by certain bilinear equations evolving on nilpotent or solvable Lie groups, the optimal conditional mean estimator consists of a finite dimensional nonlinear set of equations. The theory of harmonic analysis was used to derive suboptimal estimators for bilinear systems driven by white noise which evolve on compact Lie groups or homogeneous spaces.
Author

N75-31846*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SEQUENTIAL LEAST-SQUARES USING ORTHOGONAL TRANSFORMATIONS
Gerald J. Bierman 1 Aug. 1975 47 p refs
(Contract NAS7-100)
(NASA-CR-143485; JPL-TM-33-735) Avail: NTIS HC $3.75 CSCL 12A

Square root information estimation, starting from its beginnings in least-squares parameter estimation, is considered. Special attention is devoted to discussions of sensitivity and perturbation matrices, computed solutions and their formal statistics, consider-parameters and consider-covariances, and the effects of a priori statistics. The constant-parameter model is extended to include time-varying parameters and process noise, and the error analysis capabilities are generalized. Efficient and elegant smoothing results are obtained as easy consequences of the filter formulation. The value of the techniques is demonstrated by the navigation results that were obtained for the Mariner Venus-Mercury (Mariner 10) multiple-planetary space probe and for the Viking Mars space mission.
Author

N75-31847*# College of William and Mary, Williamsburg, Va. Dept. of Physics.
USE OF THE WIGNER REPRESENTATION IN SCATTERING PROBLEMS Final Report
E. A. Bemler Mar. 1975 66 p refs
(Contract NAS1-11808)
(NASA-CR-132737) Avail: NTIS HC $4.25 CSCL 20J

The basic equations of quantum scattering were translated into the Wigner representation, putting quantum mechanics in the form of a stochastic process in phase space, with real valued probability distributions and source functions. The interpretative picture associated with this representation is developed and stressed and results used in applications published elsewhere are derived. The form of the integral equation for scattering as well as its multiple scattering expansion in this representation are derived. Quantum corrections to classical propagators are briefly discussed. The basic approximation used in the Monte-Carlo method is derived in a fashion which allows for future refinement and which includes bound state production. Finally, as a simple illustration of some of the formalism, scattering is treated by a bound two body problem. Simple expressions for single and double scattering contributions to total and differential cross-sections as well as for all necessary shadow corrections are obtained.
Author

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N75-31848 Washington State Univ., Pullman.
THE DYNAMICAL STABILITY OF CONTINUOUS SYSTEMS Ph.D. Thesis
Melvin G. Marietta 1975 117 p
Avail: Univ. Microfilms Order No. 75-16179

The Lagrangian formulation for continuous media was derived from variational principles for perfectly general mechanical systems. The basic conservation laws for such systems were generated from first principles. Specific results were catalogued for spherical and cylindrical coordinate systems. The equilibrium equations for isotropic, homogeneous, and incompressible elastic media were recovered as are some previous results of D.R. Bland. The equations of motion for perfectly general mechanical systems which are however restricted to satisfy given constraints were then derived through the Lagrangian formulation for continuous media. Hamilton's equations for this situation were derived, and the equations for the balance of energy and angular momentum were generated from fundamental principles. The general Lagrangian formulation for continuous media was cast into the Hamiltonian form, and the stability of the resulting system of equations was examined. General stability criteria were obtained for different choices of measure spaces. Dissert. Abstr.

N75-31849# Stuttgart Univ. (West Germany). Inst. fuer Informatik.
SENSITIVITY MODEL GENERATOR AS A TOOL FOR AUTOMATIC CREDIBILITY TESTS OF CONTINUOUS SYSTEM SIMULATION
Guenter Stuebel 1975 11 p refs
(IFI-03/75) Avail: NTIS HC $3.25

A system dynamics-based corporate model of a company has been developed. Credibility tests were used to compare the results of the model with real data of the simulated company. One credibility test, the sensitivity analysis of the model, is described. Several ideas from engineering control theory were adopted for theoretical analysis. A survey of the entire system was given by describing the analytical background of the method, the sensitivity model generator concept, and a simple experiment with a continuous feedback system. Based upon these concepts, a sensitivity model generator was implemented. The results of a sensitivity model exercise are shown and discussed, and applications of this general tool are indicated. Author (ESRO)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N75-31850 Cornell Univ., Ithaca, N.Y.
APPLICATIONS OF THE RENORMALIZATION GROUP TO CRITICAL PHENOMENA Ph.D. Thesis
David Robert Nelson 1975 285 p
Avail: Univ. Microfilms Order No. 75-18140

A variety of applications of the renormalization group to critical phenomena are presented, with an emphasis on multicritical phenomena. The basic theory is briefly summarized and applied to exactly soluble models in one dimension. The analysis of multicritical phenomena begins with a treatment of metamagnetic tricritical points by epsilon expansion techniques. It concluded that metamagnets should exhibit classical tricritical behavior (as found previously by Riedel and Wegner for He(3)-He(4) mixtures). The techniques developed for treating metamagnets are extended to allow a renormalization group discussion of uniaxial antiferromagnets. In particular, a scaling analysis and concrete numerical predictions are constructed for the spin flop transition point, which is termed bicritical. A discussion is included of the crossover scaling functions associated with multicritical phenomena. The method allows construction of the crossover scaling functions as renormalization group trajectory integrals.
Dissert. Abstr.

N75-31851 Maryland Univ., College Park.
FUNCTION SPACE COMPLETIONS OF FUNCTION SPACES Ph.D. Thesis
Joel Douglas Thomison 1974 90 p
Avail: Univ. Microfilms Order No. 75-17893

Let G = G(X) be a locally convex function space consisting of linear forms defined on a vector space X. For some purposes, a completion of G formed entirely of linear forms on X will be more useful than one formed by the adjunction of abstract elements. This work extends and refines the theory of functional spaces and functional completion given by Aronszajn and Smith. The approach depends heavily on two tools developed subsequent to the appearance of the earlier theory, namely Grothendieck's completion theorem and Brace's technique of obtaining locally convex topologies via convergence on a family of filters.
Dissert. Abstr.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-31852 Texas Univ., Austin.
COMPLEX MANIFOLDS IN RELATIVITY Ph.D. Thesis
Edward John Flaherty, Jr. 1975 274 p
Avail: Univ. Microfilms Order No. 75-16672

Complex manifold theory is applied to the study of certain problems in general relativity. The mathematical theory of complex manifold, and a brief review of general relativity are given. It is shown that any spacetime admits locally an almost Hermitian structure, suitably modified to be compatible with the indefinite metric of spacetime. This structure is integrable if and only if the spacetime admits two geodesic and shearfree null congruences (if the spacetime is type D vacuum or electrified). Conditions for the modified Hermitian spacetime to be Kahlerian are presented, and the most general metric for such a modified Kahlerian spacetime is found. It is shown that the type D vacuum and electrified spacetimes are conformally related to modified Kahlerian spacetimes by a generally complex conformal factor. These latter are shown to possess a very rich structure, including the existence of Killing tensors and Killing vectors. An explanation of Newman's complex coordinate transformations is given.
Dissert. Abstr.

N75-31853# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
APPLICATION OF ATOMIC-ABSORPTION SPECTROSCOPY IN PHYSICS RESEARCH
B. V. Lvov 1975 72 p refs Transl. into ENGLISH from J. Quant. Spectr. Radiative Transfer (London), v. 12, no. 4, 1972 p 651-681 Presented at the 3d Intern. Congr. on Atomic Absorption Spectroscopy, Paris, Sep. 1971
(NRC/CNR-TT-1810) Avail: NTIS HC $4.25

Some physical applications of atomic absorption spectroscopy for determining the damping parameter alpha, oscillator strength values f, and temperature T are critically discussed. On the basis of detailed theoretical analysis, the potentialities and limitations of the 'curves of growth' method for determining the alpha-parameter and collisional width were investigated. A high-precision method for determining the alpha-parameter, based on measurement of the total (with continuum source) and line (with sharp-line source) absorption is describes. A simplified method for taking into effect of hyperfine structure on line absorption is proposed. Systematic measurements of collisional width values for resonance lines of elements of groups I-III of the periodic system permitted certain regularities to be disclosed in the variation of collisional width individual subgroups. The principal difficulty in the application of absorption methods to the determination of absolution f-values is to estimate the effective 'length' (thickness) of the absorbing layer. The limitations of classical emission methods for determining the temperature of nonuniform media are noted. Author

N75-31854*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN IMPROVED TECHNIQUE FOR DETERMINING REFLECTION FROM SEMI-INFINITE ATMOSPHERES WITH LINEARLY ANISOTROPIC PHASE FUNCTIONS
Clifford L. Fricke Washington Sep. 1975 41 p refs
(NASA-TN-D-8011; L-10153) Avail: NTIS HC $3.75 CSCL 20J

A solution to the problem of reflection from a semi-infinite atmosphere is presented, based upon Chandrasekhar's H-function method for linearly anisotropic phase functions. A modification to the Gauss quadrature formula which gives about the same accuracy with 10 points as the conventional Gauss quadrature does with 100 points was developed. A computer program achieving this solution is described and results are presented for several illustrative cases. Author

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N75-31855# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
WHISTLE NOISE IN RESIDENCE, MEASUREMENTS AND SUGGESTION FOR MASKING THE NOISE
L. X. Nepomuceno 16 May 1975 5 p In PORTUGUESE; ENGLISH summary
(Rept-7505.785) Avail: NTIS HC $3.25

A low-level, high-frequency, whistling noise which was disturbing residents of Santana was studied. It is suggested that a white noise be used to mask the disturbing noise. Author

N75-31856*# Pennsylvania State Univ., University Park.
THE PROPAGATION OF PLANE WAVES AND HIGHER ORDER ACOUSTIC MODES IN MULTISECTIONED DUCTS

B. R. Wyerman and G. Reethof 25 Sep. 1975 14 p refs
(Grant NGL-39-009-121)
(NASA-CR-143438) Avail: NTIS HC $3.25 CSCL 20A

A theoretical and experimental study of acoustic propagation in an anechoically terminated multisectioned duct was performed. A unique source array consisting of two concentric rings of sources, providing phase and amplitude control in the radial as well as circumferential direction, was developed to generate plane waves and both spinning and non-spinning higher order modes. Measurement of attenuation and radial mode shapes were taken with various finite length liners inserted between the hard wall sections of a duct with an anechoic termination. A search technique was developed to find the complex eigenvalues for a liner under the assumption of a locally reacting boundary condition. The experimental results were compared with a theoretical analysis which includes the modal transmission and reflection at the interface of each duct section, and this indicated that the local reaction boundary condition is valid for three liner configurations. Author

N75-31857*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VISUAL STUDY OF THE EFFECT OF GRAZING FLOW ON THE OSCILLATORY FLOW IN A RESONATOR ORIFICE
Kenneth J. Baumeister and Edward J. Rice Washington Sep. 1975 28 p refs
(NASA-TM-X-3288; E-8339) Avail: NTIS HC $3.75 CSCL 20D

Grazing flow and oscillatory flow in an orifice were studied in a plexiglass flow channel with a single side branch Helmholtz resonator using water as the fluid medium. An oscillatory flow was applied to the resonatory cavity, and color dyes were injected in both the orifice and the grazing flow field to record the motion of the fluid. The flow regimes associated with linear and nonlinear (high sound pressure level) impedances with and without grazing flows were recorded by a high-speed motion-picture camera. Appreciable differences in the oscillatory flow field were seen in the various flow regimes. With high grazing flows, the outflow and inflow from the resonator cavity are found to be asymmetric. The visual study confirms that jet energy loss during flow into a resonator cavity is much larger than the loss for ejection from the cavity into the grazing flow. For inflow into the resonator cavity, the effective orifice area was significantly reduced. Author

N75-31858# Stanford Univ., Calif. Thermosciences Div.
MEASUREMENT OF ACOUSTIC REFLECTION FROM OBSTRUCTIONS IN A PIPE WITH FLOW
W. E. Schmidt and J. P. Johnston Mar. 1975 64 p refs
(Grant NSF GK-37294)
(PB-241379/7) HC $4.25 CSCL 20D

A technique was developed to measure the reflection coefficients for simple plane waves incident upon a pipe obstruction (orifice, valve, etc.) in the presence of flow. The method uses correlation techniques to decompose an acoustic standing wave into incident and reflected travelling waves for the range 100-2100 Hz. Three orifices with diameters of 3/4, 1-1/4, and 2 inches were tested in the 3.82 inch diameter pipe of an aeroacoustic test facility. The experimental reflection coefficients from the 3/4 and 1-1/4 inch orifices compare favorably to available analytic results for both the flow and no flow cases. The reflection coefficients, without flow, increase with increasing frequency. When flow is present, the reflection coefficients are nearly constant across the test frequency range. GRA

N75-31859# Metropolitan Transportation Commission, Berkeley, Calif.
PRELIMINARY FINDINGS SOUND. THE ENVIRONMENT PROJECT BART IMPACT PROGRAM
Mar. 1975 46 p refs Prepared in cooperation with Gruen Associates, Los Angeles, Calif. and De Leuw, Cather and Co., Inc., Washington, D. C.
(Contract DOT-OS-30176)
(PB-241699/8; MTC-TM-13-4-75) Avail: NTIS HC $3.75 CSCL 20A

This report presents early aspects of a measurement and analysis program to assess the acoustic impact of the Bay Area Rapid Transit system (BART) on its surrounding environment. It covers findings relative to simultaneous recordings of sound levels taken on-board BART trains and at wayside positions adjacent to the BART tract. These early findings will be combined with measurements of adjacent community ambient sound levels to arrive at an overall assessment of BART acoustic impact on its surroundings. GRA

N75-31860# California Inst. of Tech., Pasadena. Karman Lab. of Fluid Mechanics and Jet Propulsion.
ACOUSTIC ATTENUATION BY VAPORIZATION OF LIQUID DROPLETS: APPLICATION TO NOISE REDUCTION IN AIRCRAFT POWERPLANTS Final Report, 1 Mar. 1971 - 30 Nov. 1974
Frank E. Marble Feb. 1975 58 p refs
(Grant AF-AFOSR-2068-71; AF Proj. 9781)
(AD-A009644; AFOSR-75-0511TR) Avail: NTIS CSCL 20/1

A cloud of small water droplets in saturated air attenuates acoustic disturbances by viscous drag, heat transfer, and vapor exchange with the ambient gas. The mechanisms of these processes are analyzed to show that the viscous and heat transfer phenomena attenuate at frequencies above the reciprocal of the Stokes relaxation time, a frequency of about 10,000 Hz for 1-micron droplets. The processes associated with phase exhange attenuate at much lower frequencies; in fact, the characteristic frequency of this attenuation may be controlled by choice of the liquid mass fraction. The strength of the phase exchange attenuation is, however, proportional to the mass of water vapor in the air, a factor controlled by air temperature. GRA

N75-31861# Hydroacoustics, Inc., Rochester, N.Y.
CALIBRATION OF HLF-3 LOW FREQUENCY HYDRO-ACOUSTIC SOURCE
10 Mar. 1975 40 p refs
(Contract N00014-72-C-0315; NR Proj. 386-602)
(AD-A009864; HA-104-75) Avail: NTIS CSCL 20/1

Calibration results of an underwater sound source are described. This source produces source level of 198 dBu 1 micro P a at 1m at 210 Hz and has an output exceeding 193 dB over the band from 170-310 Hz. It contains an integral hydraulic power supply and hydroacoustic amplifier and requires no electronic power amplifiers. The calibration data include Transmitting Response (100-600 Hz). Polar Patterns, Output Spectra, and PUlse Photographs. Data are included for both 99 feet and 323 feet depths (the source is rated for 1000 feet without pressure compensation). GRA

N75-31862# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
NATURAL INFRASOUND: A ONE YEAR GLOBAL STUDY
Gary E. Greene and Joe Howard Mar. 1975 160 p refs
(COM-75-10639/3; NOAA-TR-ERL-317-WPL-37; NOAA-75042806) Avail: NTIS MF $12.25; SOD HC as C55.13:ERL-WPL-37 CSCL 20A

Using continuous pressure records from eight infrasonic observatories around the world, the authors have compiled statistics on infrasound occurrence and on the background noise distribution that affects the detectability of infrasound. With triangulation, the source locations for over 200 infrasonic events have been established. The most frequently detected sources appear to lie in or near certain mountainous regions throughout the world. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-31863 Purdue Univ., Lafayette, Ind.
QUANTUM STATISTICAL MECHANICAL APPROACH TO MOLECULAR RELAXATION PROCESSES Ph.D. Thesis
William Alexandra Wassam, Jr. 1974 186 p
Avail: Univ. Microfilms Order No. 75-17303

A quantum statistical formulation of radiationless molecular relaxation processes is presented. The correlation function

representation of the rate constant for unimolecular reactions was utilized to evaluate the rate constants for internal conversion, vibronic-induced relaxation, and nonresonant energy transfer processes. The resulting theoretical expressions were applied to the numerical analysis of experimentally measured relaxation rates. It was shown that the general rate expression for internal conversion reduces to a simple form comprised of five phonon scattering processes in which the energy gap is modified by v=0, 1, and 2 quanta of the mediating phonon mode. This rate expression was applied to the quantitative comparison of multiphonon decay rates. General rate expressions for vibronic-induced relaxation processes and two and three body transfer processes are also discussed. Analysis of the excited states in symmetrical chlorophyll-water adducts was treated in a manner similar to that for pure crystalline solids. Dissert. Abstr.

N75-31864 Pittsburgh Univ., Pa.
KINETICS OF THE GAS PHASE REACTIONS OF N2H(+), N4(+), N3(+), O2(+) AND H3O(+) WITH WATER Ph.D. Thesis
Veronica Marie Bierbaum 1974 200 p
Avail: Univ. Microfilms Order No. 75-18225

The kinetics of the bimolecular reactions of N2H(+), N4(+), and N3(+) with water vapor and the sequential reactions of O2(+) and H3O(+) with water were studied using the flowing afterglow technique. N2H(+) undergoes a fast proton transfer reaction with water, N4(+) rapidly charge transfers with water while N3(+) participates in a slower rearrangement reaction to form H2NO(+). The rate constants for these reactions were determined and compared with other experimental values. They are discussed in terms of the Langevin, aligned dipole and average dipole orientation theories. The sequential reactions of O2(+) with water in nitrogen buffer gas, including formation and reaction of the cluster ion O2(+)(N2), were examined. The termolecular hydration sequence of H3O(+) in helium buffer gas was studied and rate constants and equilibrium constants were measured. Mass discrimination, ion-electron dissociative recombination and diffusion rates of the ions were considered and diffusion coefficients of the hydronium ions were indirectly determined. Dissert. Abstr.

N75-31865 Indiana Univ., Bloomington.
VIBRATIONAL RELAXATION OF SMALL MOLECULES IN THE LIQUID PHASE Ph.D. Thesis
Wallis Fred Calaway, Jr. 1975 75 p
Avail: Univ. Microfilms Order No. 75-17002

Vibrational relaxation was investigated in pure liquid nitrogen and solution containing small amounts of oxygen, carbon monoxide and methane. A Q-switched ruby laser was used to excite the V=1 vibrational level of nitrogen. Decay was monitored using a second ruby laser by observing the intensity of the appropriate spontaneous anti-Stokes Raman line as a function of time. The observed decay for undoped liquid nitrogen was exponential with a time constant of Tau=1 sec. Addition of oxygen, carbon monoxide or methane caused the rate of deactivation to increase. From rate constants obtained for the different systems, transition probabilities of individual relaxation processes were calculated using a simple liquid model. This model treats the liquid as a dense gas and assumes that isolated binary collisions are causing vibrational relaxation. Agreement between probabilities calculated using this model and gas results suggests that vibrational energy transfer in liquids is dominated by isolated two body interactions. Dissert. Abstr.

N75-31866 Florida Univ., Gainesville.
ELECTRON SPIN RESONANCE OF COLLISION COMPLEXES Ph.D. Thesis
Joaquin Victor Martinez de Pinillos 1974 268 p
Avail: Univ. Microfilms Order No. 75-16414

Reaction complexes formed when alkali and alkaline earth atoms are allowed to react with either C12 or F2 were isolated in argon matrices at 4K. Ionic complexes are formed where the halogen occurs as X2-, which is observable via electron spin resonance spectroscopy. The atoms were produced by heating the metal to a temperature where its vapor pressure was of the order of 0.01 torr in a Knudsen cell. The hyperfine interaction observed shows that the intermediate trapped was primarily M1X2-. The presence of the metal is detected by the broadening it produces on the X2- lines. The increases in the hyperfine splitting with decreasing ionization potential of the metal indicates that the electron resides on the X2- species. The properties of the excited states were studied by the variations observed in the components of the g-tensor. It was found that a low-lying state is mixed with the ground state via spin-orbit coupling for the case C12-. In the case of F2- the presence of the metal ion perturbed the system enough to cause a splitting of the linear molecule states and mix in an excited 2A1 state with the resulting 2B1 ground state. Dissert. Abstr.

N75-31867# Institut fuer Naturwissenschaftlich- Technische Trendanalysen, Stohl/Kiel (West Germany).
SCALAR RADIATION FIELD OF A NEUTRON-SOURCE IN LIQUID NITROGEN
B. Broecker, K. Clausen, P. Johnsen, P. Schneider-Kuehnle, and M. Weinert Bonn Bundeswehramt 1974 42 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVG-FBWT-74-12) Avail: NTIS HC $3.75; Budeswehramt DM 30

A set of measured values was established for testing computational methods and computer programs for the calculation of the radiation transport from nuclear weapons. The scalar neutron and gamma radiation field from a 14 MeV neutron source in liquid nitrogen was measured. The original spectrum of the initial radiation from nuclear weapons is not known, but every error source, which applies for the calculation of the transport of this radiation also applies for the calculation of the radiation transport from a monoenergetic neutron source with the highest possible energy for thermonuclear weapons. The following measured values are presented in form of tables and diagrams: the neutron fluence between 20 keV and 17 MeV; the gamma fluence between 0,3 and 10 MeV; the neutron dose; and the gamma dose. These are normalized to one source neutron and multiplied by 4 pi sqr, for distances from 60 to 240 cm between neutron source and detector. Author (ESRO)

N75-31868# Institut fuer Naturwissenschaftlich- Technische Trendanalysen, Stohl/Kiel (West Germany).
SCALAR RADIATION FIELD OF A NEUTRON-SOURCE IN LIQUID AIR
B. Broecker, K. Clausen, P. Johnson, P. Schneider-Kuehnle, and M. Weinert Bonn Bundeswehramt 1974 38 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVG-FBWT-74-13) Avail: NTIS HC $3.75; Bundeswehramt DM 20

A set of measured values was established to be used for testing computational methods and computer programs for the calculation of the radiation transport from nuclear weapons. The scalar neutron and gamma radiation field from a 14 MeV neutron source in liquid air was measured. The following measured values are presented in form of tables and diagrams: neutron fluence between 20 keV and 18 MeV, gamma fluence between 0,7 and 10 MeV, neutron dose, and gamma dose. Author (ESRO)

N75-31869# Institut fuer Naturwissenschaftlich- Technische Trendanalysen, Stohl/Kiel (West Germany).
CALORIMETRIC MEASUREMENT OF ABSORBED DOSE IN A PULSED GAMMA RADIATION FIELD [KALORIMETRISCHE MESSUNG DER ABSORBIERTEN DOSIS IN EINEM GEPULSTEN GAMMASTRAHLUNGSFELD]
D. Kallmeyer, O. Koehn, and U. J. Roose Bonn Bundeswehramt 1974 34 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BWVG-FBWT-74-14) Avail: NTIS HC $3.75; Bundeswehramt DM 20

To describe radiation induced damage in modern weapon system electronic components, the absorbed dose must be determined. Measurements of absorbed dose in the elements lead, silicon, and aluminum are reported. The measurements are performed using a semiadiabatic microcalorimeter operating at the temperature of liquid nitrogen. The described technique draws its importance from the fact that it is an absolute and direct method to measure the absorbed dose that a pulsed gamma radiation field of unknown spectrum deposits in a given absorbing

material. The spectrum independent measurement is achieved by calibrating the measured quantities directly with a precisely determined amount of electric energy. The range of the reported measurements extends from approximately 0.5 to 1000 rad.
Author (ESRO)

N75-31870# Pittsburgh Univ., Pa.
ATOMIC AND MOLECULAR PROCESSES Final Report, 1 Jul. 1973 - 30 Jun. 1974
Manfred A. Biondi 24 Feb. 1975 7 p refs
(Contract DAHC04-73-C-0037; ARPA Order 2686)
(AD-A009790; ARO-11427.2-P) Avail: NTIS CSCL 07/4

The research topics carried out under the present contract are stated and references are given to the publications of the scientific findings resulting from the research. The personnel supported by the contract are listed. Research was carried out in the areas of atomic collisions and upper atmosphere studies.
GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N75-31871*# Kanner (Leo) Associates, Redwood City, Calif.
CALCULATION OF THE INITIAL THICKNESS OF THE MICROLAYER IN NUCLEAR BOILING
G. F. Smirnov Washington NASA Sep. 1975 14 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (USSR), v. 28, Mar. 1975 p 503-508
(Contract NASw-2790)
(NASA-TT-F-16573) Avail: NTIS HC $3.25 CSCL 20H

A simplified model was proposed for studying the formation of a thin liquid layer (microlayer) at the base of a vapor bubble during nucleate boiling. A relationship was established between the initial thickness of the microlayer and local hydrodynamic parameters. The proposed model is found to be useful for approximate quantitative analyses in cases when heat transfer through the microlayer makes a significant contribution to the boiling process at smooth surfaces.
Author

N75-31872# Army Foreign Science and Technology Center, Charlottesville, Va.
NUCLEAR REACTIONS AND THE INTERACTION OF NEUTRONS WITH MATTER
D. V. Skobeltsyn 29 Jun. 1974 303 p refs Transl. into ENGLISH from Akad. Nauk SSSR. Fiz. Inst. Tr. (USSR), v. 63, 1972 p 1-160
(AD-A009563; FSTC-HT-23-825-74) Avail: NTIS CSCL 20/8

Nuclear reactions caused by neutrons are examined along with nonstationary neutron transport in moderators. Experimental methods of investigating nuclear reactions are also described.
Author

N75-31873# Army Foreign Science and Technology Center, Charlottesville, Va.
THERMIONIC CONVERSION IN 1972
D. Karetnikov 20 Nov. 1974 5 p Transl. into ENGLISH of the 8th Session of the Intern. Inform Panel on Thermo-Emission Conversion, USSR
(AD-A009344; FSTC-HT-23-0249-75) Avail: NTIS CSCL 10/2

The Topaz-3 thermionic reactor was tested to obtain a longer service life and higher efficiency coefficient. The tests of the thermo-emission reactor were conducted simultaneously with tests of separate electrogenerating channels. Improvements concerned problems of fragment elimination and collector heat dissipation. Investigations of nonstationary properties of cesium plasmas continued; an unexpectedly larger reduction of the neutral component concentration as arcing occurs during thermo-emission conversion was discovered experimentally.
Y.J.A.

N75-31874# Ballistic Research Labs., Aberdeen Proving Ground, Md.
DOPPLER SHIFT LIFETIME AND GAMMA-RAY ANGULAR MEASUREMENTS IN 93NB Final Report
R. M. Tapphorn and R. Shnidman Apr. 1975 68 p refs
(AD-A009698; BRL-1773) Avail: NTIS CSCL 20/8

Mean lifetimes for four levels in 93Nb have been measured by the Doppler-shift attenuation method. Gamma-ray angular distributions have been measured for the gamma decay of excited levels in 93Nb up to 1127 keV in excitation. The levels were excited by the 90Zr(alpha, p gamma)93Nb reaction at a bombarding energy of 14.77 MeV. Spectra of gamma rays in coincidence with protons were obtained with a 55-cc Ge(Li) detector. Spin assignments obtained from the present results for the low-lying positive-parity levels in 93Nb are in agreement with previous assignments. A spin of 3/2(-) has been assigned to a level at 685 keV in excitation and a spin of 5/2(-) (3/2-) has been assigned to an 809-keV negative-parity level. Gamma-ray mixing ratios measured for the gamma decay of excited low-lying levels in 93Nb have been combined with lifetime measurements to calculate the electromagnetic transition strengths. The experimental E2 transition strengths are shown to be consistent with those predicted by a weak-coupling model.
GRA

N75-31875# Naval Research Lab., Washington, D.C.
THE ADVANCED CONCEPTS PROGRAM. SECTION 4: FISCAL YEAR 1974 Annual Report
D. Mosher, G. Cooperstein, J. G. Siambis, R. E. Lee, and S. A. Goldstein Mar. 1975 95 p refs
(AD-A009766; NRL-MR-3006-Sect-4) Avail: NTIS CSCL 20/9

This volume describes the theoretical and experimental research concerned with the generation and dynamics of relativistic electron beams and their interaction with high atomic number materials carried out as part of the DNA Advanced Concepts Program. This work is one section of a five volume annual report. Topics discussed include: beam-plasma interaction theory; Diode-simulation studies; pinched beam experiments.
GRA

74 OPTICS

Includes light phenomena.

N75-31876 Texas Univ., Austin.
THE OPTICS OF RELATIVISTIC SOURCES IN A SPHERICALLY SYMMETRIC GRAVITITATIONAL FIELD Ph.D. Thesis
Gerald Alan Campbell 1975 160 p
Avail: Univ. Microfilms Order No. 75-16652

The effects of spectral shifts and gravitational focussing on radiation from sources moving geodesically in the Schwarzschild gravitational field is analyzed using the general-relativistic equations for geodesic motion and for the propagation of radiation along null geodesics in the geometrical optics approximation. The exact solutions of the Schwarzschild geodesic equations are briefly discussed for the null and time-like cases, and the method of classifying the orbital types of motion based on the effective radial potential is presented. A method of finding the stability of these orbits using this technique is discussed. The geometrical optics approximation for the propagation of radiation is discussed, and the area-intensity law for the Schwarzschild field is derived. Numerical techniques for calculating radiation patterns from the propagation equations are discussed, including techniques for obtaining the time variation along geodesics and differences in propagation time along different null geodesics.
Dissert. Abstr.

N75-31877*# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
EVALUATION OF ATOMIC CONSTANTS FOR OPTICAL RADIATION, VOLUME 1 Final Report, Nov. 1970 - Feb. 1974
C. D. Kylstra and R. J. Schneider Dec. 1974 36 p refs
(Grant NGL-10-005-049)
(NASA-CR-143460) Avail: NTIS HC $3.75 CSCL 20F

Atomic constants for optical radiation are discussed which include transition probabilities, line strengths, and oscillator strengths for both dipole and quadrupole transitions, as well as

the associated matrix elements needed for line broadening calculations. Atomic constants were computed for a wide selection of elements and lines. An existing computer program was used, with modifications to include, in an approximate manner, the effect of equivalent electrons, and to enable reordering and restructuring of the output for publication. This program is suitable for fast, low cost computation of the optical constants, using the Coulomb approximation formalism for LS coupling. Author

N75-31878*# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
EVALUATION OF ATOMIC CONSTANTS FOR OPTICAL RADIATION, VOLUME 2 Final Report, Nov. 1970 - Feb. 1974
C. D. Kylstra and R. J. Schneider Dec. 1974 323 p refs
(Grant NGL-10-005-049)
(NASA-CR-143425) Avail: NTIS HC $9.25 CSCL 20F

Various atomic constant for 23 elements from helium to mercury were computed and are presented in tables. The data given for each element start with the element name, its atomic number, its ionic state, and the designation and series limit for each parent configuration. This is followed by information on the energy level, parent configuration, and designation for each term available to the program. The matrix elements subtables are ordered by the sequence numbers, which represent the initial and final levels of the transitions. Each subtable gives the following: configuration of the core or parent, designation and energy level for the reference state, effective principal quantum number, energy of the series limit, value of the matrix element for the reference state interacting with itself, and sum of all of the dipole matrix elements listed in the subtable. Dipole and quadrupole interaction data are also given. Y.J.A.

N75-31879*# Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.
SOLID STATE ELECTRO-OPTIC COLOR FILTER AND IRIS Final Report, Dec. 1974 - Jun. 1975
Jun. 1975 108 p refs Original contains color illustrations
(Contract NAS9-13549)
(NASA-CR-144436; AED-R-4103) Avail: NTIS HC $5.25 CSCL 20F

A pair of solid state electro-optic filters (SSEF) in a binocular holder were designed and fabricated for evaluation of field sequential stereo TV applications. The electronic circuitry for use with the stereo goggles was designed and fabricated, requiring only an external video input. A polarizing screen suitable for attachment to various size TV monitors for use in conjunction with the stereo goggles was designed and fabricated. An improved engineering model 2 filter was fabricated using the bonded holder technique developed previously and integrated to a GCTA color TV camera. An engineering model color filter was fabricated and assembled using PLZT control elements. In addition, a ruggedized holder assembly was designed, fabricated and tested. This assembly provides electrical contacts, high voltage protection, and support for the fragile PLZT disk, and also permits mounting and optical alignment of the associated polarizers. Author

N75-31880*# Arizona Univ., Tucson. Optical Sciences Center.
USER'S MANUAL FOR UNIVERSITY OF ARIZONA APART PROGRAM (ANALYSIS PROGRAM - ARIZONA RADIATION TRACE)
Robert P. Breault Aug. 1975 137 p
(Contract NAS8-27804)
(NASA-CR-143938) Avail: NTIS HC $5.75 CSCL 20F

A description and operating instructions for the Analysis Program Arizona Radiation Trace (APART) are given. This is a computer program that is able to efficiently and accurately predict the off-axis rejection characteristics of unwanted stray radiation for complex rotationally symmetric optical systems. The program first determines the critical objects or areas that scatter radiation to the image plane either directly or through imaging elements: this provides the opportunity to modify, if necessary, the design so that the number of critical areas seen by the image plane is reduced or the radiation to these critical areas is minimized. Next, the power distribution reaching the image plane and a sectional power map of all internal surfaces are computed. Angular information is also provided that relates the angle by which the radiation came into a surface to the angle by which the radiation is scattered out of the surface. Y.J.A.

N75-31881# Colorado Univ., Boulder. Electromagnetics Lab.
NON-DEGENERATE SURFACE WAVE MODE COUPLING OF A SYSTEM OF DIELECTRIC WAVEGUIDES Interim Report
Edward F. Kuester and David C. Chang Oct. 1974 55 p refs
(Grant AF-AFOSR-2417-72; AF Proj. 9768)
(AD-A008641; SR-9; AFOSR-75-0477TR) Avail: NTIS CSCL 20/6

A number of different methods in the literature for calculating the coupling between surface wave modes on parallel optical waveguides are examined and found to give identical results only for degenerate modes. A new variational derivation of the coupling coefficients is given, which is extended in a straightforward manner to include anisotropic guides and/or an arbitrary number of guides or modes. The character of the differences between the various methods in the non-degenerate case is discussed, and the approximations required are investigated numerically for the case of two parallel slab waveguides. GRA

N75-31882# Army Electronics Command, Fort Monmouth, N.J.
A STUDY OF TRANSMITTANCE MODELS FOR THE 15-MICRON CO2 BAND
Joseph H. Pierluissi and Richard B. Gomez Apr. 1975 15 p refs
(DA Proj. 1T6-2111-AH-71)
(AD-A009723; ECOM-5559) Avail: NTIS CSCL 07/4

The general five-parameter band model for molecular absorptance in the infrared was used in the generation of numerous model variations in order to perform a feasibility analysis of band model representation of the 15 micron CO2 band. The accuracy of the models was evaluated by comparisons with the original line-by-line calculated spectra for vertical paths through a standard inhomogenous atmosphere. The medium inhomogeneity was taken into consideration through the use of the Curtis-Godson relations, including moment variations. Line intensity effects were studied with actual intensity data averaged over 5/cm and with the use of a temperature-dependent factor. It was concluded that a band model representation may provide sufficient accuracy to be of value in meteorological applications only if the number and phenomenological nature of the band parameters are allowed to vary significantly throughout the band. Author (GRA)

N75-31883# Rockwell International Corp., Anaheim, Calif. Electronics Research Div.
THIN FILM LIGHT SOURCES FOR INTEGRATED OPTICS
D. B. Anderson, R. R. August, J. E. Coker, J. T. Boyd, and R. Shubert Apr. 1975 150 p refs
(Contract F33615-73-C-1041; AF Proj. 6100)
(AD-A009901; C73-292.23/501; AFAL-TR-75-53) Avail: NTIS CSCL 20/6

The study and experimental demonstration of concepts adapting existing laser media to a planar format such that it can be coupled to an optical waveguide compatible with representative integrated optical circuits is presented. The approach considers distributed-feedback waveguide lasers incorporating a coupler to extract the radiation and launch the radiation into the output waveguide. The distributed-feedback concept is employed because it is compatible with planar processing technology, eliminating orthogonal boundaries which are necessary for Fabry-Perot resonant structures. Several laser-waveguide coupler approaches amenable to both monolithic and hybrid approaches were investigated. Distributed-feedback stimulated emission was observed using both the fundamental (1150 A) and third harmonic (3500 A) gratings in an electron injection laser, using a quasi-double-heterostructure (large optical cavity), where both liquid-phase and vapor-phase epitaxy were employed. A new side wall coupling technique appropriate for GaAs electron injection lasers was demonstrated which is compatible with either a distributed-feedback or Fabry-Perot resonant structure. This latter hybrid configuration was demonstrated to couple with a GaAlAs epitaxial waveguide on Al2O3 Through the evanescent field associated with the longitudinal active waveguide region. GRA

N75-31884# Stanford Research Inst., Menlo Park, Calif.
THEORY OF OPTICAL IMAGE IMPROVEMENT
F. J. Dyson Mar. 1975 110 p refs
(Contract DAHC15-73-C-0370; ARPA Order 2504; SRI Proj. 3000)
(AD-A009803; SRI-JSR-73-11) Avail: NTIS CSCL 20/6

This report outlines a general theory of feedback systems designed to compensate the image-degrading effects of atmospheric seeing in real time. :Real time: means that the optical surfaces must move rapidly enough to keep the image in sharp focus at each instant. The report demonstrates that a system producing diffraction-limited resolution in a large ground-based telescope is possible, in principle. The field of sharply focused view is very narrow (of the order of 10 seconds of arc), and the system can work only with moderately bright objects (about magnitude 10 or brighter). Secion I presents a general discussion and summary of results. Section II continues with a rigorous solution of the problem of the design of an optimum feedback system for stabilizing the phases in a simple two-beam optical interferometer perturbed by a fluctuating atmosphere. The same method of optimization is applied to the design of complete image-improvement systems in the remainder of the report. In Sections III through VI a system for real-time correction of atmospheric seeing in an optical telescope is described in detail. Sections VII through X cover the same ground as Sections III through VI. No new physical principle is introduced, but the theory of single-image optical improvement systems is recast into a form that is mathematically more precise and more general. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-31885 California Univ., Los Angeles.
NUMERICAL SOLUTIONS OF NONLINEAR PLASMA EQUATIONS BY THE FINITE ELEMENT METHOD Ph.D. Thesis
Zohair Yahya Ezzuddin 1975 134 p
Avail: Univ. Microfilms Order No. 75-17783

Numerical solutions of the nonlinear Vlasov's equation for a collisionless plasma by means of the finite-element Galerkin approximation are considered. An algorithm suitable for numerical calculations is proposed and explicit error estimates are given. Using these estimates, it is shown that the approximate solutions generated by the proposed algorithm converge to the true solution. The rate of convergence for the finite-element Galerkin approximation of the nonlinear Vlasov-Poisson equations is also established. Numerical applications of the proposed algorithm were made for the case of a one dimensional electron-ion plasma. Dissert. Abstr.

N75-31886 Purdue Univ., Lafayette, Ind.
EQUILIBRIUM AND STABILLTY PROBLEMS FOR A TOROIDAL MAGNETOHYDRODYNAMIC SYSTEM Ph.D. Thesis
Daniel Charles Barnes 1974 180 p
Avail: Univ. Microfilms Order No. 75-17153

The equilibrium and stability of an axisymmetric toroidal system was examined for the case when the inverse aspect ratio is small and the poloidal component of the magnetic field is small compared to the toroidal component. The system was approximately a toroidal theta pinch, and toroidal effects were considered. The equilibrium magnetic field contains a singularity because of the toroidal geometry. By introducing a parameter which maintains this singularity a finite distance from the surface of the plasma relative to the plasma radius, the above mentioned limit can be recovered. The stability of such an equilibrium was examined using the magnetohydrodynamic energy principle. A general technique for computing the external magnetic field for an arbitrary cross section is given. Finally, a prescription for computing the magnetohydrodynamic energy quadratic form for a general cross section is given. The equilibrium and stability of an elliptical cross section was considered by these techniques. Dissert. Abstr.

N75-31887 Texas Univ., Austin.
THEORY AND EXPERIMENTS IN THE SIMULATION OF COLLISIONLESS PLASMAS Ph.D. Thesis
Adam Thomas Drobot 1975 198 p refs
Avail: Univ. Microfilms Order No. 75-16665

A computerized simulation to follow the evolution of collisionless plasma interactions was formulated from a one-dimensional plasma model. The motion of plasma particles was treated in both the Newtonian and relativistic limits while the self-consistent electric field was assumed to be electrostatic. Experiments conducted with the simulation involved: the cold electronion instability, the weak electron-electron streaming interaction, the return-current instability and a constant field-driven instability in a homogeneous plasma. The results showed excellent agreement with corresponding linear theories. The simulation technique was also extended to two dimensions. Full relativistic and electromagnetic effects were included. Versions written allow for either cylindrical or Cartesian spatial dependence and all three velocity components. The two-dimensional results showed the existence of new nonlinear effects and have brought the modeling of plasmas closer to their physical reality. Dissert. Abstr.

N75-31888 Texas Univ., Austin.
LARGE AMPLITUDE MAGNETIC PULSE PENETRATION INTO CYLINDRICAL PLASMA Ph.D. Thesis
King Hay Tsui 1975 109 p
Avail: Univ. Microfilms Order No. 75-16752

Experiments have shown anomalous penetration of large amplitude magnetic pulse in a fast theta pinch that could not be explained by linear theory. A coherent approach based on a set of nonlinear magnetohydrodynamic and Maxwell's equations was used to study this phenomena. To include the cylindrical convergence effect, the equations are written in cylindrical coordinates. The equations are transformed into Lagrangian coordinates and further reduced into nonlinear coupled partial differential equations of magnetic field and electron density. They are solved subject to initial and boundary conditions by numerical methods. The code is written for arbitrary initial density profile and with or without static magnetic field. The results, which show that the velocity of penetration scales like Alfven velocity, agree with observed experimental data. This suggests an alternative explanation other than the turbulent and Helicon wave approaches of the anomalous penetration. Dissert. Abstr.

N75-31889 Florida Univ., Gainesville.
INTEGRAL EQUATIONS AND DISTRIBUTION FUNCTIONS FOR HYPERDENSE PLASMAS AND A LOCAL EXCHANGE CORRELATION APPROXIMATION FOR MANY ELECTRON SYSTEMS Ph.D. Thesis
Kin-Chue Ng 1974 118 p
Avail: Univ. Microfilms Order No. 75-16428

The hypernetted chain equation is solved numerically for the classical one-component plasma. The radial distribution functions obtained agree qualitatively with the Monte Carlo results in the fluid region. Integral equations are investigated. The Poisson-Boltzmann equation is solved for the sodium plasma with the effective potentials calculated by Shin. The radial distribution functions obtained are quite accurate when the temperature is above 5 or 10 Rydbergs but are poor when the temperature is below 2 Rydbergs. A local exchange-correlation approximation for calculating the ground-state wavefunction and energy for a finite system of electrons is introduced. The local approximation proposed does not depend on the density gradient expansion but rather on the mean-value theorem. It is therefore expected to be reasonably accurate for a system with large density fluctuations. Numerical results for atoms indicate that the new scheme is overall more accurate than some other local approximation schemes. Dissert. Abstr.

N75-31890 Georgia Inst. of Tech., Atlanta.
MICROWAVE TRANSIENT RESPONSE MEASUREMENTS OF ELASTIC MOMENTUM TRANSFER COLLISION FREQUENCY Ph.D. Thesis
Dwight Alexander McPherson 1975 150 p
Avail: Univ. Microfilms Order No. 75-17490

Microwave transient response measurement of the elastic momentum transfer collision frequency of electrons in gases is applied to the determination of the electron collision frequency in argon gas as a function of electron energy in the energy range from 0.08 eV to 4 eV. The microwave transient response is the electromagnetic response of a weakly ionized gas, immersed in a uniform magnetic field, to a short pulse of microwave energy at the electron cyclotron frequency. Under the proper experimental conditions, the decay rate of the transient response envelope is a direct measure of the electron momentum transfer collision frequency averaged over the electron velocity distribution. The monoenergetic collision frequency is derived from the experimental data through the solution of those integral equations which analytically describe the collision frequency averaging process. The collision frequencies determined in the transient response measurements agree with the data derived from dc electron swarm measurements in the electron energy ranges on either side of the argon Ramsauer minimum. Dissert. Abstr.

N75-31891 California Univ., Los Angeles.
SECULAR MODE COUPLING AND ANOMALOUS DRAG: A THEORY OF PLASMA TURBULENCE WITH APPLICATION TO THE ELECTRON BEAM-PLASMA INSTABILITY Ph.D. Thesis
James Frederick Drake, Jr. 1975 296 p
Avail: Univ. Microfilms Order No. 75-17784

The interaction of resonant or nearly resonant particles with waves in turbulent plasmas leads to a secular deviation of the particles from their free streaming orbits. Equations are found which describe the energy exchange between electrostatic waves and particles in a one-dimensional turbulent plasma. It was found that the turbulence breaks up the large scale coherent oscillations of particles in the plasma into spatially local oscillations, causing a broadening of the wave energy in k space. The mode coupling and drag are included in the numerical calculations of the evolution of the bump-on-tail instability. The wave energy spreads towards high phase velocity modes while the particle velocity distribution evolves toward a state characterized by the bunching of particles in velocity space in the resonant region of the largest amplitude waves. Dissert. Abstr.

N75-31892 Texas Technological Univ., Lubbock.
HIGH TEMPERATURE THETA PINCH PLASMA INTERACTION WITH A SOLID PELLET Ph.D. Thesis
William Charles Nunnally 1974 123 p
Avail: Univ. Microfilms Order No. 75-17759

The interaction of a high temperature, theta pinch plasma with spherical, .2 mm diameter polystyrene pellets was observed. The pellets are not displaced or completely vaporized after many half cycles of theta pinch action. The vaporized material remains mainly neutral in the center of the theta pinch plasma. The vaporized material is ionized, however, when a Q-switched ruby laser is focused on the pellet cloud. The engineering design and development of a small, fast, efficient theta pinch system including a low inductance, high current, high voltage dielectric switch is described. In addition, the design and application of Mach Zehnder interferometry, image converter camera photography, a differential diamagnetic loop, soft X-ray foil absorption and spectroscopy as diagnostics for the plasma-solid interaction are discussed.
Dissert. Abstr.

N75-31893# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
MEASUREMENTS OF POLOIDAL MAGNETIC FIELD PERTURBATIONS IN ALCATOR
L. C. J. M. deKock, B. J. H. Meddens, L. T. M. Ornstein, D. C. Schram, and R. J. J. vanHeijningen Oct. 1974 17 p refs
Sponsored in part by US AEC and Neth. Organ. for Pure Sci. Res. (ZWO)
(Rept-74-86; PRR-7414) Avail: NTIS HC $3.25

Poloidal field pick-up coils with a winding density varying as the cosine or the sine of the angle m times theta, where m is the azimuthal Fourier component and theta is the azimuthal angle, have been found capable of detecting instantaneously modes with azimuthal periodicity m. The construction of a bakeable version of these coils is described. The winding density of these coils varies in a stepwise manner so as to approximate the cosine or sine functional dependence. Toroidal effects and the eccentric position of the plasma column with respect to the coil system are shown to cause signals at the coils with other m-numbers than the instability. A typical example of the use of these coils is shown. Author (ESRO)

N75-31894# Groupe de Recherches Ionospheriques, Issy-les-Moulineaux (France).
THEORY OF INSTANTANEOUS TRIPLE-PROBE IN A LOW DENSITY CONTINUUM PLASMA
Jen-Shih Chang Aug. 1974 23 p refs
(GRI/NTP/132) Avail: NTIS HC $3.25

An exact theory was developed for a triple-probe in the low density continuum limit, i.e. when the mean free paths are much shorter than the probe size and, in turn, the probe size is much shorter than the Debye length. The theory applies to any probe geometry having rotational symmetry, including spheres and finite cylinders, and yields the same form for the probe characteristic for all such shapes. The equation for measuring the electron temperature yields the exact same result was that from the ideal collisionless triple-probe theory. The case of the negative ion-positive ion plasma, presence of cooling effect, finite Debye ratio, and finite mean free path conditions were also discussed. Author (ESRO)

N75-31895# Princeton Univ., N.J. Plasma Physics Lab.
NONLINEAR PROCESSES IN PLASMAS Final Report, 1 Mar. 1970 - 31 Dec. 1974
Russell M. Kulsrud 7 Mar. 1975 18 p refs
(Contract F44620-70-C-0033; AF Proj. 9751)
(AD-A008864; AFOSR-75-0583TR) Avail: NTIS CSCL 20/9

The discovery and elucidation of parametric instabilities and their application to the modification of the ionosphere by intense radar beams was pursued under this contract. The theory of their linear growth was developed and their nonlinear saturation mechanism worked out. Research was done on the nonlinear results of these instabilities and their application to other areas such as laser heating of pellets. The general mathematical theory underlying nonlinear phenomena continued to be developed in connection with the Korteweg-deVries equation which seems to be the prototype equation for large amplitude disturbances. Methods of obtaining a large number of exact solutions of this equation was developed. GRA

N75-31896# Innsbruck Univ. (Austria). Inst. for Theoretical Physics.
PLASMA PHYSICS AND PLASMA INSTABILITIES. A HANDBOOK FOR PHYSICISTS AND ENGINEERS Interim Report
Ferdinand F. Cap Jan. 1975 76 p refs
(Contract F44620-75-C-0006; AF Proj. 9751)
(AD-A008886; C-PD-6; AFOSR-75-0358TR) Avail: NTIS

This is the sixth partial delivery of an Engineer's Handbook on plasma instabilities and their use, control, stabilization and engineering application. The book will be necessary for design and feasibility studies of thermonuclear fusion and other plasma engineering devices. The sixth partial delivery presents chapter 8 (Plasma Containment). It covers the following sections: 8.1 Classification of containment systems; 8.2 Self-containment and the pinch-effect; 8.3 Magnetohydrostatics and magnetic surfaces; 8.4 Two-dimensional equilibria; 8.5 Toroidal equilibria; 8.6 Tokamaks and high beta systems; 8.7 Containment in Vlasov and CGL theories. GRA

N75-31897# Avco-Everett Research Lab., Everett, Mass.
PLASMA RADIATION EFFECTS Final Report
H. Hyman, R. T. V. Kung, and C. W. VonRosenberg, Jr. 6 Feb. 1975 32 p refs
(Contract DNA001-73-C-0151; DARPA Order 1433; DNA Proj. NWED-QAXH-I002)
(AD-A009341; DNA-3554F) Avail: NTIS CSCL 20/9

Shock tube experiments and theoretical results are presented for continuous and line radiation from 2 to 15 micrometers in an oxygen plasma around 10,000K. The experimental effort also includes results for neon and argon and shows clear evidence of line emission around 7.5 micrometers predicted by theory. The theoretical effort includes calculation of continuous (Kramer's and neutral bremsstrahlung) and line radiation from an equilibrium oxygen plasma, and solution of the long-standing puzzle

concerning the existence of a strong 4 micrometers line in all the gases studied by Taylor and Caledonia. In fact, a series of prominent lines, of which this is one, is predicted to be present in the infrared spectra of all atoms. GRA

N75-31898# Case Western Reserve Univ., Cleveland, Ohio.
DYNAMICS OF A FOCUSSED DISCHARGE Final Scientific Report, 1 Feb. 1970 - 31 Jan. 1975
Osman K. Mawardi 31 May 1975 58 p refs
(Grant AF-AFOSR-1889-70; AF Proj. 9751)
(AD-A009646; AFOSR-75-0516TR) Avail: NTIS CSCL 20/9

This report describes theoretical and experimental investigations on the dynamics of a dense plasma focus. The characteristics of the focus in terms of X-ray and neutron production are described. A diagnostic procedure for the analysis of the momentum of the deuterons ejected from the focus is also described. The results of a preliminary theoretical investigation of the heating of a dense plasma focus by a laser is given. GRA

N75-31899# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
THERMOELECTRIC CORRECTIONS ON THE ENERGY TRANSPORT ACROSS PLASMA-SOLID INTERFACES
M. Niimura, P. W. Chan, and R. J. Churchill Jun. 1974 76 p refs
(Contract F19628-70-C-0035; AF Proj. 7260)
(AD-A009626; SR-11; AFCRL-TR-74-0285) Avail: NTIS CSCL 20/9

The amount of plasma energy contained in the free-stream column and stagnation interfaces in direct contact with cooled tungsten electrodes of a direct-current, atmospheric argon arc has been corrected taking into account the thermoelectric effect of a partially ionized plasma. The thermoelectric correction factors to be assessed for the conventional thermal conductivities of fully ionized plasma have been tabulated as a function of the equilibrium temperature of argon at atmospheric pressure. The density diffusion contribution of the thermal conductivity has been calculated. The corrected full-field reduced thermal conductivity has been used for the calculation of the radial temperature profiles corresponding to the axial electron temperatures which were measured by a Thomson scattering experiment. The axial electric field intensity and current density could be determined correctly from the calculated radial temperature profiles and photographic observation of the arc. At the arc-electrode interface the state of plasma is treated by a two-temperature gas model. Comprehensive formula useful for the calculations of both the anode and cathode fall energy transfer modes are presented. GRA

N75-31900# Columbia Univ., New York. Plasma Research Lab.
HYDROMAGNETIC HEATING OF PLASMAS Final Report
Robert A. Gross 1 Apr. 1975 8 p refs
(Contract F44620-71-C-0010; AF Proj. 9752)
(AD-A009649; AFOSR-75-0518TR) Avail: NTIS CSCL 20/9

A thorough exploration and study was performed by both experiments and computer simulation of the structure of ionizing and MHD shock waves, the plasma dynamics of the shock flow fields, and the properties of the plasma state created by these strong shock waves. GRA

N75-31901# Princeton Univ., N.J. Plasma Physics Lab.
APPLICATION OF NONLINEAR PLASMA PHYSICS TO SPACE PHYSICS Final Report, 1 Jan. - 31 Dec. 1974
Russell M. Kulsrud and Francis W. Perkins 10 May 1975 10 p refs
(Contract F44620-73-C-0026; AF Proj. 9751)
(AD-A009651; AFOSR-75-0661TR) Avail: NTIS CSCL 20/9

Work on the importance of parametric instabilities for modification of the ionosphere by strong radio wave heating was continued under this contract. The saturation mechanism for the amplitude of these instabilities was determined. A new mechanism for wave-wave coupling was discovered and invoked to explain the many field-aligned plasma density striation phenomena which occurred in the ionospheric heating experiments. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N75-31902 Rutgers Univ., New Brunswick, N.J.
ULTRASONIC INVESTIGATIONS OF THE JAHN-TELLER EFFECT Ph.D. Thesis
Michael Edward Mullen 1975 188 p
Avail: Univ. Microfilms Order No. 75-17464

Several transition metal and rare earth compounds were investigated ultrasonically, the changes in sound velocity being used as a probe. The coupling of the ultrasonically produced strain field to the energy levels of the transition metal and rare earth ions (a manifestation of the Jahn-Teller effect) causes readily discernable changes in the sound velocity. It is found that behavior is dependent on the temperature, the strength of the coupling, and the crystal field parameters. Examples of all behavior types are experimentally demonstrated, as well as variations of these types due to magnetic interactions and transitions. For cubic structures, the coupling constants are calculated from the crystallographic data of the compounds, using a point charge approximation. In the case of the lanthanide antimonides, the constants so calculated agree well with experimental values. Studies of the velocity anisotropy in nematic and cholesteric liquid crystals, nematic-isotropic, and cholesteric-nematic phase transitions were also performed. Dissert. Abstr.

N75-31903 Purdue Univ., Lafayette, Ind.
A SUPERCONDUCTING SAMPLING SYSTEM Ph.D. Thesis
Arthur Jerome Bond 1974 117 p
Avail: Univ. Microfilms Order No. 75-17161

The ability to store a persistent current in a superconducting loop was used to develop a superconducting sampling system. In this system a persistent current loop stores a sample of an input signal and applies it to the input stage of a crossed film cryotron (CFC) amplifier. A theoretical analysis based on an improved electrical equivalent circuit for superconducting switching element is included. It is shown that the switching speed of the sampling cryotrons determines the upper cutoff frequency of the system. The experimental results agree qualitatively with the theoretical analysis. These results show that the effective bandwidth of the sampling system represents at least an order of magnitude increase over that of the CFC amplifier operating in its normal mode. The product of minimum detectable energy with the response time of the superconducting sampling system is 10 to the minus 30th power. Dissert. Abstr.

N75-31904 Arizona Univ., Tucson.
THERMAL GRADIENTS, THE ELECTRON WIND AND THIN FILM FAILURE RATES Ph.D. Thesis
Peter Koert 1975 230 p
Avail: Univ. Microfilms Order No. 75-17828

To determine the role of the thermal gradients and the electron wind in the failure of thin film aluminum conductors, an attempt was made to correlate void formation in time and space with particle density depletion. Experiments were performed on both uniform and tapered conducting strips for various current densities, sample thicknesses, and thermal conditions. The tapered strip proved to be more suitable for void formation studies. When the results of the thermal measurements were used in the solution of the particle density diffusion equation, a good correlation was obtained between particle density depletion and void formation. Dissert. Abstr.

N75-31905 Purdue Univ., Lafayette, Ind.
OPTICAL IMAGE DETECTION VIA LIGHT ENHANCED SECOND HARMONIC GENERATION ON A SEMICONDUCTOR COUPLED-ACOUSTIC SURFACE WAVE DELAY LINE Ph.D. Thesis
Paul Stanley Schenker 1974 155 p
Avail: Univ. Microfilms Order No. 75-17278

A solid state optical imaging device based on light enhanced second harmonic generation in a coupled semiconductor-acoustic surface wave configurations was developed. The device

converts one dimensional variations in optical intensity to time correlated variations in the amplitude of an electrical output signal. Experimental measurements were used to determine the range of intensities to which the device is responsive, dynamic range of the output signal, and resolution. The effect of semiconductor surface state charging on device speed was investigated. An apparent anomalie in device input-output signal characteristics provided insights useful in expanding the range of intensities to which the device can respond. These results were found to be plausible based on the predictions of a quasi-linear theory for second harmonic generation in the coupled semiconductor-acoustic surface wave configuration. Simplified theoretical estimations of upper bounds on device performance regarding sensitivity, dynamic range, resolution, and speed are presented.
Dissert. Abstr.

N75-31906 Iowa State Univ. of Science and Technology, Ames.
PRODUCTION OF MULTICOMPONENT THIN FILMS BY rf COSPUTTERING Ph.D. Thesis
Barry F. T. Bolker 1975 92 p
Avail: Univ. Microfilms Order No. 75-17381

A combination of rf cosputtering, film temperature control, and film bias control was investigated in the Te-As and Te-As-Ge systems to determine the feasibility of obtaining films of many different compositions from a single main sputtering target. Each of the techniques proved to be effective in influencing the film composition. An initial deficiency of Te observed in the films was attributed to the relatively poorer Te sticking coefficient. Ge was the cosputtered element, and it contributed theoretically predicted amounts of material to the films up to 18 1/2 at% Ge level. Substrate temperature and substrate bias were seen to have a strong influence on the As/Te ratio of the films, and very little influence on the Ge content. The Te content of the films decreased for substrate temperatures between -150 C and 20 C, and then increased for temperatures between 20 C and 90 C. The temperature effect was caused by the change of the Te sticking coefficient with change in temperature. Application of an rf bias to the substrate caused a linear decline in the Te content of the films.
Dissert. Abstr.

N75-31907 Purdue Univ., Lafayette, Ind.
AN EVAPORATED ALUMINUM OXIDE METAL-INSULATOR-SEMICONDUCTOR STUDY Ph.D. Thesis
Victor Joseph Ohm 1974 146 p
Avail: Univ. Microfilms Order No. 75-17259

The characteristics of metal-insulator-semiconductor (MIS) capacitors using an electron-beam evaporated aluminum oxide film were investigated by measurement of physical and electrical properties of devices fabricated on the semiconductors silicon and gallium arsenide. The insulator film was deposited at substrate temperatures from 25 C to 250 C to be compatible with compound semiconductors. An ultra-high vacuum system was used. The aluminum oxide dielectric was first characterized through study of layer thickness, refractive index, etch rates, optical morphology and microchemical composition profiles. The electrical performance of the MIS structures was investigated through capacitance versus voltage measurements. A computer program was developed to calculate ideal MIS device performance to be compared with measured C-V response. Bias-temperature stress tests indicated both ion drift and temperature-induced trapping effects. The C-V method was also used to study interfacial surface state density.
Dissert. Abstr.

N75-31908*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SEARCH FOR SOLID CONDUCTORS OF Na(+) AND K(+) IONS: FIVE NEW CONDUCTORS
J. Singer, H. Kautz, W. Fielder, and J. Fordyce 1975 26 p refs Presented at Am. Ceramic Soc., Washington, D. C., 3-7 May 1975
(NASA-TM-X-71753; E-8377) Avail: NTIS HC $3.75 CSCL 20L

Five conductors of three structure types were discovered which, as solids, can transport Na(+) or K(+) ions with conductivities of approximately .00001/(omega cm) at 300 K. These compounds are: (1) the pyrochlores NaTaWO6 and NaTa2O5F, both with an activation energy for conduction delta E of 21 kJ/mole; (2) the body- centered cubic form of NaSbO3, with delta E = 42 kJ/mole; and (3) the niobates 2Na2O with 3Nb2O5 and 2K2O with 3Nb2O5, with the alkali ions probably in open layers of the incompletely determined structure; delta E = 17 kJ/mole. On the basis of approximately 40 structure types, some generalizations were made regarding the relation between structure and ionic transport.
Author

N75-31909*# National Bureau of Standards, Washington, D.C.
ALKALI OXIDE-TANTALUM, NIOBIUM AND ANTIMONY OXIDE IONIC CONDUCTORS Final Report, 1 Jan. - 31 Dec. 1974
R. S. Roth, W. S. Brower, H. S. Parker, D. B. Minor, and J. L. Waring Apr. 1975 77 p refs
(NASA Order C-50821-C)
(NASA-CR-134869; NBSIR-75-754) Avail: NTIS HC $4.75 CSCL 20L

The phase equilibrium relations of four systems were investigated in detail. These consisted of sodium and potassium antimonates with antimony oxide and tantalum and niobium oxide with rubidium oxide as far as the ratio 4Rb2O:IIB2O5 (B=Nb, Ta). The ternary system NaSbO3-Sb2O4-NaF was investigated extensively to determine the actual composition of the body centered cubic sodium antimonate. Various other binary and ternary oxide systems involving alkali oxides were examined in lesser detail. The phases synthesized were screened by ion exchange methods to determine mobility of the mobility of the alkali ion within the niobium, tantalum or antimony oxide (fluoride) structural framework. Five structure types warranted further investigation; these structure types are (1) hexagonal tungsten bronze (HTB), (2) pyrochlore, (3) the hybrid HTB-pyrochlore hexagonal ordered phases, (4) body centered cubic antimonates and (5) 2K2O:3Nb2O5. Although all of these phases exhibit good ion exchange properties only the pyrochlore was prepared with Na(+) ions as an equilibrium phase and as a low porosity ceramic. Sb(+3) in the channel interferes with ionic conductivity in this case, although relatively good ionic conductivity was found for the metastable Na(+) ion exchanged analogs of RbTa2O5F and KTaWO6 pyrochlore phases.
Author

N75-31910# Institut Franco-Allemand de Recherches, St. Louis (France).
PROGRESS OF ISL RESEARCH ON ENERGY CONVERSION IN FERROELECTRIC CERAMICS OF THE TYPE Pb(ZrLxTix) O3 [ETAT ACTUEL DES RECHERCHES A L'ISL SUR LES PROBLEMES DE CONVERSION D'ENERGIE A L'AIDE DE CERAMIQUES FERROLECTRIQUES DU TYPE Pb(ZrL-xTix) O3]
F. Bauer 22 Oct. 1974 8 p refs In FRENCH Presented at the Reunion Franc. de Ferroelectricite, Nantes, France, 27 Sep. 1974
(ISL-29/74) Avail: NTIS HC $3.25

Adiabatic depolarization of prepolarized ferroelectric ceramics by a plane shockwave was studied. The shock wave at the interface of a missile has a velocity of 200 m/s and the ceramic has an intensity of 20 kbar and lasts a few microseconds. The electric energy liberated by a 10 mm diameter and 0.5 mm thickness Pb(Zr 0.965 Ti0.035)(03+1percent Nb2O5) disk attained 4500 V after 100 ns and decreased thereafter while pressure remains on a plateau value. Phase transitions or nonlinear piezoelectric behavior are hypothesized.
ESRO

N75-31911# Tel-Aviv Univ. (Israel). School of Engineering.
BOUNDS FOR EFFECTIVE PERMITTIVITIES OF LOSSY DIELECTRIC COMPOSITES Interim Report
Kalman Schulgasser (Ben Gurion Univ. of the Negev, Beersheva, Israel) and Zvi Hashin Dec. 1974 18 p refs
(Grant AF-AFOSR-2591-74; AF Proj. 9782)
(AD-A008856; SR-2; TAU-SOE-129/74; AFOSR-75-0473TR)
Avail: NTIS CSCL 20/12

A statistically homogeneous and isotropic two-phase composite is considered. The constituents are dielectrics with low loss factors. Bounds are found on the dielectric behavior of the composite using the fact that the imaginary part of the complex permittivity is small compared to the real part. The bounds on loss factor are found generally (with one exception) to be the best possible based only on volume fractions and constituent properties. Further, it is shown that for dielectric constituents whose dielectric constants are nearly unvarying with frequency,

the loss factor of the aggregate is simply a linear combination of the loss factors of the constituents. GRA

N75-31912# Newcastle-upon-Tyne Univ. (England). Dept. of Electrical and Electronic Engineering.
NEW PASSIVATION METHODS FOR GaAs Final Technical Report, 1 Jan. - 31 Dec. 1974
H. L. Hartnagel, R. Sign, H. Hasegawa, and K. E. Forward Jan. 1975 89 p refs
(Contract DAJA37-74-C-1703)
(AD-A009780) Avail: NTIS CSCL 20/12

The fabrication of high-quality oxides on GaAs with good electrical interface properties was investigated. The best results were obtained with a new anodization scheme based on an aqueous solution of tartaric or citric acid with glycol, and a subsequent annealing at 250 C. In view of increased corrosion resistance of the resulting oxides if some amount of aluminum is included, and in view of an optimization of interface lattice matching, semi-insulating GaAlAs was grown by sliding-boat liquid-phase epitaxy prior to anodization. A new method of depositing pure Al2O3 by slow evaporation of aluminum through an oxygen atmosphere of 0.0005 torr also gave encouraging results. The best electrical interface properties obtained make the results useful for optical devices. Author (GRA)

N75-31913# Army Foreign Science and Technology Center, Charlottesville, Va.
STRUCTURE OF SEMICONDUCTOR COMPOUNDS IN THE PSEUDOBINARY SYSTEMS OF PbTe-Bi2Te3, SnTe-Bi2Te3, GeTe-Bi2Te3, SnTe-Sb2Te3
T. B. Zhukova and A. I. Zaslavskii 29 May 1974 9 p ref Transl. into ENGLISH from Mono. Nekotor. Vopr. Khim. i Fiz. Poluprovodslozh. Sostava, Uzhgorod (USSR), 1970 p 158-163
(AD-A009345; FSTC-HT-23-422-74) Avail: NTIS CSCL 20/2

The diffraction class and extinction patterns as well as unit cell parameters of a number of semiconductors were measured from epigrams on the slip plane and X-ray diffraction photos. Integral intensities of the reflections were determined by a diffractometer and processed by a digital computer. The unit cell parameters and structure and calculated interatomic distances are presented. The parameters for GeBi4Te7 differ, mainly in the C parameter, owing to the introduction of NaCl structures into the substance. Author (GRA)

N75-31914# Florida Univ., Gainesville. Dept. of Electrical Engineering.
INVESTIGATION OF ELECTRONIC TRANSPORT, RECOMBINATION AND OPTICAL PROPERTIES IN InAs1-xPx ALLOY SYSTEMS Semiannual Technical Report, Jun. - Dec. 1974
Sheng S. Li 15 Dec. 1974 64 p refs
(Contract DAAK02-74-C-0102; ARPA Order 2182)
(AD-A009438; SATR-2) Avail: NTIS CSCL 20/12

A systematic study has been carried out on the dependence of the electron mobility and concentration on the epitaxial layer thickness for seven InAs(0.65)P(0.35) epitaxial samples with film thickness varying from 10 micrometers to 4 micrometers. (It was found that an epilayer thickness around 6 micrometers yields the highest electron mobility and lowest electron concentration for this set of samples. A technique has been developed in the Laboratory to examine the atomic composition, the epilayer thickness and the homogeneity of the epilayer using Electron Microprobe Analysis. The optical absorption coefficient as a function of wavelength near the fundamental absorption edge was plotted for 13 epitaxial samples of different alloy compositions. The energy band gap versus alloy composition for these samples was also determined. GRA

N75-31915# Litton Systems, Inc., Morris Plains, N.J. Airtron Div.
PREPARATION AND SINGLE CRYSTAL GROWTH OF YLiF4 LASER MATERIALS Final Report, 1 Jan. - 31 Oct. 1974
Robert Uhrin, Roger F. Belt, and Richard C. Puttbach Jan. 1975 57 p refs
(Contract N00014-70-C-0379)
(AD-A009895) Avail: NTIS CSCL 20/5

This report describes fluoride preparation and single crystal growth of the solid state crystal laser of composition Y(.45)Er(.499)Tm(.05)Ho(.001)LiF4. The respective component fluorides were prepared from 5-9's oxides by hydrofluorination at 800-1200C in a platinum reactor. Single crystal growth was performed by a seeded-solution method utilizing platinum apparatus under a N2-HF atmosphere. Techniques were developed for core drilling and fabricating (3 x 30 mm) or (3 x 50 mm) a-axis cylindrical rods. Passive optical tests have demonstrated high quality and freedom from scattering sites. Infrared analyses on 5-10 cm paths have shown low ppm trace molecular impurities. Active laser tests in long pulse and Q-switch operation are not completed but preliminary data indicate threshold above 10 joules due to compositional effects. GRA

N75-31916# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH Quarterly Technical Summary Report, 1 Nov. 1974 - 31 Jan. 1975
Alan L. McWhorter 17 Apr. 1975 73 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-A009848; ESD-TR-75-118) Avail: NTIS CSCL 20/12

This report covers in detail the solid state research work of the Solid State Division at Lincoln Laboratory for the period 1 November 1974 through 31 January 1975. The topics covered are Solid State Device Research, Quantum Electronics, Materials Research, and Microelectronics. GRA

N75-31917# Polytechnic Inst. of New York, Brooklyn.
COMPOUNDS WITH DEFECT LATTICE STRUCTURES Final Report, 1 Aug. 1971 - 28 Feb. 1975
Ephraim Banks 26 Mar. 1975 121 p refs
(Grant DA-ARO(D)-31-124-72-G7; DA Proj. 2O0-61102-B-13)
(AD-A009785; ARO-3948.12-C) Avail: NTIS CSCL 07/4

The major research efforts described in this report involve the study of magnetic interactions in complex alkali-transition metal fluorides and the study of rare earth-defect interactions in cadmium fluoride, the latter having led to the development of an efficient family of infrared to visible converting phosphors, easily prepared in single crystal form, and possibly adaptable to a number of night-vision and display devices. A number of exploratory experiments have been done, some with a view to finding materials which might show metal-insulator transitions. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

No abstracts in this category.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N75-31918# Committee on Labor and Public Welfare (U. S. Senate).
EFFECTS OF THE ENERGY CRISIS ON EMPLOYMENT DISLOCATION, 1974
Washington GPO 1974 101 p Hearing before Subcomm. on Labor of Comm. on Labor and Public Welfare, 93d Congr., 2d Sess., 12 Feb. 1974
(GPO-35-761) Avail: Subcomm. on Labor

The impact of the energy crisis on the state of New Jersey is discussed. Testimony is provided on the impact of the energy crisis on the state of New Jersey. Topics discussed include: unemployment due to plant closings and inability to get to

work; public and private transportation; price of gasoline and oil; and necessity of conservation. J.M.S.

N75-31919*# Toledo Univ., Ohio.
THE TOTAL ASSESSMENT PROFILE, VOLUME 1
G. Leininger, S. Jutila, J. King, W. Muraco, J. Hansell, J. Lindeen, E. Franckowiak, and A. Flaschner Aug. 1975 427 p
(Contract NAS3-17826)
(NASA-CR-134863-Vol-1) Avail: NTIS HC $11.25 CSCL 05K

A methodology is described for the evaluation of societal impacts associated with the implementation of a new technology. Theoretical foundations for the methodology, called the total assessment profile, are established from both the economic and social science perspectives. The procedure provides for accountability of nonquantifiable factors and measures through the use of a comparative value matrix by assessing the impacts of the technology on the value system of the society. Author

N75-31920*# Toledo Univ., Ohio.
THE TOTAL ASSESSMENT PROFILE, VOLUME 2
G. Leininger, S. Jutila, J. King, W. Muraco, J. Hansell, J. Lindeen, E. Franckowiak, and A. Flaschner Aug. 1975 232 p refs
(Contract NAS3-17826)
(NASA-CR-134863-Vol-2) Avail: NTIS HC $7.50 CSCL 05K

Appendices are presented which include discussions of interest formulas, factors in regionalization, parametric modeling of discounted benefit-sacrifice streams, engineering economic calculations, and product innovation. For Volume 1, see N75-31919. M.J.S.

N75-31921# Lincoln Lab., Mass. Inst. of Tech., Lexington.
COMPUTER ASSISTED INSTRUCTION: SOME TECHNO-ECONOMIC FACTORS
Robert C. Butman Apr. 1975 52 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-A008802; TN-1975-23; ESD-TR-75-150) Avail: NTIS CSCL 05/9

Successful implementation and use of any CAI system requires that careful attention be given to the costs and benefits of CAI in the chosen environment. This paper considers costs as a function of system utilization factors and size and geographic dispersion of the student population. Comparisons are made between three generic CAI systems -- a system with several thousand terminals, a system with 128 terminals and a system where the computer is integral with each terminal. GRA

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-31922 California Univ., Los Angeles.
THE PRAXEOLOGY OF DESIGN, MANAGEMENT, AND POLICY MAKING Ph.D. Thesis
Malcolm George Wolfe 1975 218 p
Avail: Univ. Microfilms Order No. 75-16801

A systems planning and design is presented which utilizes a systems approach and includes a decision making vector which consists of three entities: (1) the policy maker, (2) the project manager, and (3) the designer. Often the solution to a problem is designed to attack the symptoms rather than the cause of the problem and sometimes results in a problem more severe than the original problem. It is suggested that this phenomenon is due to an individual's problem solving style of each of the elements in the decision making vector and the relative positions they hold in a power hierarchy. The roles and activities of the three entities were probed in depth to determine how the decision making system functions and to isolate those factors which lead to irrational decisions and, hence, to poorly designed systems. A systemized approach to the planning of a space transportation system is presented. A computer simulation program was used as a tool in the planning and design effort. Dissert. Abstr.

N75-31923*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ANGULAR DISTRIBUTIONS OF ELECTRONS OF ENERGY Esub e GREATER THAN 0.06 MeV IN THE JOVIAN MAGNETOSPHERE
D. D. Sentman and J. A. VanAllen Jan. 1975 47 p refs
(Contract NAS2-6553)
(NASA-CR-143419; U-of-Iowa-75-3) Avail: NTIS HC $3.75 CSCL 03B

The results of an angular distribution analysis of the electron intensity data recorded near Jupiter for the period from 26 November to 14 December 1973 are presented. The data were from three directional particle detectors with effective integral electron energy thresholds of 0.06, 0.55, and 5.0 Mev, respectively. It was found that the central core of the magnetosphere, within 12 Jupiter radii, is dominated by pitch angle distributions strongly peaked at alpha = 90 deg, while the region from 12 to 25 Jupiter radii shows bidirectional and approximately equal maxima at alpha = 0 and 180 deg. Bidirectional angular distributions in the magnetodisc out to the radius of the magnetopause strongly suggest quasi-trapping on closed field lines as the predominant situation. Substantial field aligned, unidirectional streaming was detected on only two occasions. No distinctive effects on angular distributions were discerned near the L-shells of satellites. Author

N75-31924*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
DETAILED REQUIREMENTS DOCUMENT FOR THE INTERACTIVE FINANCIAL MANAGEMENT SYSTEM (IFMS), VOLUME 1
D. B. Dodson Jul. 1975 674 p refs
(Contract NAS9-12200)
(NASA-CR-144423; LEC-1625-Vol-1) Avail: NTIS HC $15.25 CSCL 05A

The detailed requirements for phase 1 (online fund control, subauthorization accounting, and accounts receivable functional capabilities) of the Interactive Financial Management System (IFMS) are described. This includes information on the following: systems requirements, performance requirements, test requirements, and production implementation. Most of the work is centered on systems requirements, and includes discussions on the following processes: resources authority, allotment, primary work authorization, reimbursable order acceptance, purchase request, obligation, cost accrual, cost distribution, disbursement, subauthorization performance, travel, accounts receivable, payroll, property, edit table maintenance, end-of-year, backup input. Other subjects covered include: external systems interfaces, general inquiries, general report requirements, communication requirements, and miscellaneous. Subjects covered under performance requirements include: response time, processing volumes, system reliability, and accuracy. Under test requirements come test data sources, general test approach, and acceptance criteria. Under production implementation come data base establishment, operational stages, and operational requirements. Y.J.A.

N75-31925# National Bureau of Standards, Washington, D.C. Experimental Technology Incentives Program.
PROCEEDINGS OF GSA/ETIP SYMPOSIUM ON PROCUREMENT PRACTICES Final Report
31 May 1974 96 p Symp. held 29-31 May 1974 Sponsored in part by Federal Supply Service, Washington, D. C.
(COM-75-10527/0; NBSIR-75-696) Avail: NTIS HC $4.75 CSCL 15E

The general objectives of the symposium were to open government-industry dialogue on ways to encourage technological innovation in the development of products purchased by the Federal Government; to explore methods of developing a 'spin-off' effort so that the consumer marketplace might benefit from such innovations. Workshops were organized to consider specific product grouping in: (1) office machines, (2) furniture, (3) containerization/packaging, (4) ADP-peripheral/supplies, (5) instrumentation, (6) electrical equipment, (7) automotive products, (8) photographic and audio visual, and (9) chemical. GRA

N75-31926# New Mexico State Univ., Las Cruces.
SUPERVISORS MINI-LIBRARY SERIES. NUMBER 1: JOB PLANNING, BUDGETING TIME AND EFFORT
Feb. 1975 110 p
(PB-241902/6; USCSC-74-NM-01) Avail: NTIS HC $5.25 CSCL 05I

Topics regarding the supervisory position are discussed including why planning and budgeting of time and effort are important to a supervisor, basic factors in job planning applicable to supervisory positions, and ways to work with maximum efficiency. GRA

N75-31927# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
FORWARD ALGORITHMS AND PLANNING HORIZONS FOR DYNAMIC AND LINEAR PROGRAMMING
Thomas E. Morton Feb. 1975 36 p refs Sponsored by ONR
(AD-A009871; RR-358) Avail: NTIS CSCL 05/1

When available, efficient forward algorithms with planning horizon procedures better suit the needs of real world managers with limited forecast information and computational budges than conventional programming approaches. (A forward algorithm efficiently solves longer and longer horizon sub-problems. A planning horizon procedure is a stopping rule specifying when further lengthening the horizon will give a negligible effect on current decisions output by the model). Various researchers have previously obtained such results for particular models in the areas of convex production planning. Here the regeneration set ideas developed by lundin and Morton are extended to provide full planning horizon procedures for any finite deterministic dynamic programming or linear programming model. GRA

N75-31928# Center for Naval Analyses, Arlington, Va. Operations Evaluation Group.
A STOCHASTIC MODEL FOR THE CLAMP RESUPPLY SYSTEM
Christopher B. Haas Nov. 1974 17 p refs
(Contract N00014-68-A-0091)
(AD-A009398; CRC-275) Avail: NTIS CSCL 15/5

A method for modeling elements of the Navy's CLAMP resupply system is described and examples are presented. GRA

N75-31929# Army Materiel Command, Texarkana, Tex. Intern Training Center.
GENERAL FUNCTIONAL SYSTEMS REQUIREMENT FOR A NUMERICAL CONTROL MANAGEMENT INFORMATION SYSTEM Final Report
James William Bachand Mar. 1975 122 p refs
(AD-A009409; USAMC-ITC-02-08-75-202) Avail: NTIS CSCL 13/8

This report contains the General Functional Systems Requirement (GFSR) for a Management Information System for 40 Numerical Control Machines located at Rock Island Arsenal, Rock Island, Illinois. The GFSR is accomplished in the Systems Planning And Definition Phase of an Army Management System Life Cycle. Basically, the GFSR is a system definition that conceptually establishes requirements of the system in accordance with AR 18-1, tailored to the needs of management to whom the system will benefit. The advent of a Pilot Automated Shop Loading and Control System at Rock Island has created a need for a means of determining the efficiency of the numerical control machines with respect to the production operations there. This report establishes the criteria necessary to fulfill this need. GRA

N75-31930# Army Materiel Command, Texarkana, Tex. Intern Training Center.
NUMERICAL METHODS FOR THE EVALUATION OF POTENTIAL RESEARCH AND DEVELOPMENT CONTRACTORS Final Report
Steven W. Peterson Apr. 1975 56 p refs
(AD-A009415; USAMC-ITC-02-08-75-214) Avail: NTIS CSCL 05/1

This research is intended to establish a numerical technique to aid in the evaluation of potential research and development contractors. The Delphi Technique is presented as a method for assigning weights to certain critical factors that must be considered prior to making a source selection. A complete procedure for applying the method is given along with sensitivity and significance tests for evaluating results. GRA

N75-31931# Army Aviation Systems Command, St. Louis, Mo.
A GUIDE FOR PROTOTYPE QUANTITY SELECTION Final Report
John I. Hansen May 1975 49 p refs
(AD-A009771; USAAVSCOM-TR-75-8) Avail: NTIS CSCL 05/1

The purpose of the study was to develop an objective, quantified guideline to assist a decision maker in determining the appropriate number of prototypes that he should have to accomplish the testing program. Tables and graphs were constructed by using the concepts of the Binomial Probability Distribution. Case examples are also included to explain actual program application. It was found reasonable to use the Binomial model for a majority of prototyping applications. GRA

N75-31932# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF OD TECHNOLOGY IN THE US NAVY: A CASE STUDY M.S. Thesis
Thomas J. Colavito Mar. 1975 166 p refs
(AD-A009905) Avail: NTIS CSCL 05/1

The U.S. Navy has recently institutionalized procedures for conducting organization development interventions within the operating forces. This effort is being executed by Human Resource Management Centers and Detachments (HRMC/D). The technology employed by the HRMC/D is explored in a case study of an intervention into a surface combatant. The case is analyzed and compared with conventional literature in the field. The comparison reveals that a greater emphasis is required by the Navy in achieving the necessary collaborative relationship between the client and the consultant. Recommendations for improving this deficiency and other aspects of the technology are proposed. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N75-31933 Purdue Univ., Lafayette, Ind.
TOWARD A FORMAL THEORY FOR THE REQUIREMENTS STATEMENT, ANALYSIS, AND DESIGN OF INFORMATION SYSTEMS Ph.D. Thesis
Thomas Inn Min Ho 1974 194 p
Avail: Univ. Microfilms Order No. 75-17212

A formal model of an information system was formulated as a vehicle for expression of a theory for the requirements statement, analysis, and computer-aided design of information systems. The first step in computer-aided design of an information system was the statement of information requirements in a Requirements Statement Language (RSL), a language for stating system requirements without needing to state the procedures implementing the system. Then, analysis was performed in order to verify that the RSL statement satisfied specified logical conditions for satisfactory system design and construction. The formal model provided the criteria for requirements statement facilities of an RSL and for the capabilities of software for requirements statement analysis. The automation of system design and construction was achieved by the statement, in terms of the formal model, of algorithms for generation of logical design specifications for program module and data base structure. Dissert. Abstr.

N75-31934*+ National Aeronautics and Space Administration, Washington, D.C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS
Jul. 1975 63 p refs
(NASA-SP-7039(07)-Section-1) Avail: NTIS HC $3.00
CSCL 05B

This bibliography is issued in two sections: Section 1 - Abstracts, and Section 2 - Indexes. This issue of the Abstract Section cites 158 patents and applications for patent introduced into the NASA scientific and technical information system during the period of January 1975 through June 1975. Each entry in the Abstract Section consists of a citation, an abstract, and, in

most cases, a key illustration selected from the patent or application for patent. This issue of the Index Section contains entries for 2830 patent and application for patent citations covering the period May 1969 through June 1975. The index section contains five indexes -- subject, inventor, source, number and accession number. Author

N75-31935*+ National Aeronautics and Space Administration, Washington, D.C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES
Jul. 1975 489 p refs
(NASA-SP-7039(07)-Section-2) Avail: NTIS HC $5.00 CSCL 05B

For abstract, see N75-31934.

N75-31936 Iowa State Univ. of Science and Technology, Ames.
AN INTERFACE PROCESSOR FOR A HIGH SPEED RECIRCULATING DATA NETWORK Ph.D. Thesis
Chong Chun Lee 1975 234 p
Avail: Univ. Microfilms Order No. 75-17398

An original contribution to the knowledge about general purpose interface processors for locp connected data communication systems is presented. The research goals are: (1) to discover critical parameters in interfacing such a system, (2) to determine a near optimum organization for an interface processing unit, and (3) to demonstrate on a general and detailed basis that such a system is feasible. Critical parameters in the system were found to be the processing rates for the various table matches; this problem was solved by a processor specially developed for high speed sequential table searching operations. The interface was organized as a multi-processor system which had three small processors working concurrently for different interfacing problems. Feasibility of such a system is demonstrated by block diagrams, flowcharts, and detailed discussion. Dissert. Abstr.

N75-31937# Select Committee on Committees (U. S. House).
THE CONGRESS AND INFORMATION TECHNOLOGY
Robert L. Chartrand Washington GPO 5 May 1974 280 p refs Rept. prepared for Select Comm. on Committees, 93d Congr., 2d Sess., 8 Mar. 1974 Prepared by the Library of Congr., Sci. Policy Res. Div.
(GPO-30-165) Avail: SOD HC $2.25

The role of electronic computers and related information systems techniques is examined in terms of traditional congressional rules, procedures, and legislative services. Congressional information requirements, legislative-executive information exchange considerations, and the growing awareness on the part of Congress of the benefits and limitations inherent in employing computer and microform technology are discussed. Legislative efforts to improve information support during the 1945-1970 period are reviewed along with information systems development in the House of Representatives, Senate, and the three legislative support elements. Consideration is given to the progress experienced by State legislatures in utilizing innovative tools and techniques. Legislative use of information technology is perceived in the light of discernible changes in services required, requisite safeguards for congressional information, and the need to orient legislative personnel to the potential of the new tools and methodology. Author

N75-31938*# Caspan Corp., Houston, Tex. Engineers and Constructors.
REMOTE SENSING FOR LAND USE ANALYSIS Final Report
Jun. 1975 18 p
(Contract NAS9-12698)
(NASA-CR-144392) Avail: NTIS HC $3.25 CSCL 05B

Preparation of cataloging and indexing reports of land use remote sensor data is described. Topics discussed include: land use mapping and scribing; collation of LANDSAT investigation reports; and reformating and collation of Skylab 4 tabular and plot data for data bank entry. J.M.S.

N75-31939# Forsvarets Teletekniska Lab., Stockholm (Sweden).
SEMINAR ON RELIABILITY DATA BANKS
A. Ullman, comp. (Swedish Assoc. of Maintenance Engr., UTEK) Nov. 1973 381 p Proc. held at Stockholm, 15-17 Oct. 1973 (FTL-A-A16:41) Avail: NTIS HC $10.25

The need and feasibility of reliability data banks were discussed in 19 papers; the operation of data banks was exemplified, including the collection, pooling, and use of data that may be used by mathematical models. An important feature was to study the extent to which data banks could be used for equipment including types of components other than electronic, such as purely mechanical components. It was suggested that a working group should be appointed with the objective of collecting the required information. Y.J.A.

N75-31940*# D P Associates, Inc., Huntsville, Ala.
GENERAL PURPOSE SIMULATION SYSTEM OF THE DATA MANAGEMENT SYSTEM FOR SPACE SHUTTLE MISSION 18 Final Report
Neal M. Bengtson, Joseph M. Mellichamp, and Jack Crenshaw 15 Jul. 1975 103 p
(Contract NAS8-31458)
(NASA-CR-143942) Avail: NTIS HC $5.25 CSCL 05B

The simulation program of the science and engineering data management system for the space shuttle is presented. The programming language used was General Purpose Simulation System V (OS). The data flow was modeled from its origin at the experiments or subsystems to transmission from the space shuttle. Mission 18 was the particular flight chosen for simulation. First, the general structure of the program is presented and the trade studies which were performed are identified. Inputs required to make runs are discussed followed by identification of the output statistics. Some areas for model modifications are pointed out. A detailed model configuration, program listing and results are included. Author

N75-31941# European Space Research and Technology Center, Noordwijk (Netherlands).
MATERIALS DATA RETRIEVAL AT ESTEC
J. Dauphin and B. Ryden Paris ESRO Apr. 1975 32 p refs
(ESRO-TN-120-ESTEC) Avail: NTIS HC $3.75

An interaction data retrieval system allowing the selection of suitable materials for spacecraft applications is described. Main points considered in data entry of thin materials are vacuum, radiation, and thermal effects. The materials are identified by trade name and number, manufacturer's name, type of product, and chemical nature. Micro-VCM (outgassing) data and thermo-optical properties were stored as selection criteria. Materials properties were extracted from open literature, unpublished American sources, internal ESRO documents, and ESRO contractor reports. The documents are available in microfiche. Examples of interaction dial-up searches are given, and costs involved are discussed. ESRO

N75-31942# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 29, NO. 4
Waldo G. Magnuson, Jr. and Victoria S. Hewitson 30 Apr. 1975 63 p
(AD-A009007; ESN-29-4) Avail: NTIS CSCL 05/2

The monthly publication presents brief articles concerning recent developments in European Scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by disclosing interesting information well in advance of the usual scientific publications. GRA

N75-31943# Massachusetts Inst. of Tech., Cambridge.
RESEARCH PROGRESS IN ELECTRONICS, COMMUNICATIONS, LASERS, AND ATOMS, MOLECULAR, AND SURFACE PHYSICS Progress Report
Jan. 1975 347 p refs
(Contract DAAB07-74-C-0630)
(AD-A008673; PR-115) Avail: NTIS CSCL 05/2

Research projects are summarized. Topics discussed include molecular microscopy, electron optics, physical electronics and surface physics, atomic resonance and scattering, quantum electronics, infrared instrumentation astronomy, microwave and millimeter wave techniques, radio astronomy, electrodynamics of media, transport phenomena in solids, physical acoustics, gravitation research, plasma dynamics, processing and transmission of information, detection and estimation theory, digital signal

processing, speech communications, and neurophysiology.
Author

N75-31944# Colorado State Univ., Fort Collins. Dept. of Management Science and Information Systems.
A STUDY OF CRITICAL FACTORS IN MANAGEMENT INFORMATION SYSTEMS FOR U. S. AIR FORCE Final Report
D. M. Carter, H. L. Gibson, and R. A. Rademacher 31 Mar. 1975 188 p refs
(Grant AF-AFOSR-2438-73; AF Proj. 9778)
(AD-A009647; AFOSR-75-0517TR) Avail: NTIS CSCL 05/1

The report discusses the effectiveness of computer-based information systems as dependent upon many factors. The investigators in the MIS study addressed two major questions--(1) What are the most critical factors contributing to the successful development of an information system; and (2) can the factors be measured so that a model(s) can be developed to predict the success or failure of a particular information system effort. Data were collected through interviews with systems and management personnel in various industries and governmental agencies, through use of questionnaires, and through a search of the literature. Study efforts resulted in the development of a general purpose goal programming model in the interactive computer mode. GRA

N75-31945# National Bureau of Standards, Washington, D.C. Information Technology Div.
COST RECOVERY IN PRICING AND CAPACITY DECISIONS FOR AUTOMATED INFORMATION SYSTEMS Final Report
James A. DeiRossi Apr. 1975 63 p refs Sponsored in part by National Science Foundation
(COM-75-10616/1; NBS-TN-864; LC-75-600015) Avail: NTIS MF $2.25; SOD HC as C13.46:864 CSCL 05B

The cost-benefit implications of alternative pricing and capacity investment decisions for automated scientific and technical information retrieval systems are examined. Typical systems are studied and numerical examples presented. Results are discussed. GRA

N75-31946# National Bureau of Standards, Washington, D.C.
DIMENSIONS/NBS. VOLUME 59, NUMBER 4, APRIL 1975 Monthly Technical News Bulletin
Apr. 1975 25 p refs
(COM-75-50141-04; NBS/DIM-59/4; LC-25-26527) Avail: NTIS MF $2.25; SOD HC as C13.13:59 CSCL 05B

Short summaries are presented of major technical developments; highlights of work in progress, major speeches and statements by Bureau management, and a listing of NBS publications. The table of contents for the current issue is: computer networks are here; there's more to comfort than hot air; laser-induced photochemical enrichment of isotopes; NBS tests epoxies to protect bridges; harnessing the sun; highlights; managing information as a resource; effects on piezoelectric accelerometers determined; NBS to study computers and copyrights; new standards for computer codes and controls; revised bill for voluntary metric conversion submitted to Congress, and natural hazard evaluation of existing building. GRA

N75-31947# Rhode Island Univ., Kingston. Graduate School of Oceanography.
A STORAGE FORMAT FOR CURRENT METER DATA
William P. Kramer May 1975 21 p refs
(Contract N00014-68-A-0215-0003; NR Proj. 083-165)
(AD-A009833; Ref-75-2) Avail: NTIS CSCL 08/3

A recently established data archiving group at URI has adopted a format for the storage of current meter data. The storage format chosen serves two purposes. It is used for in-house data storage and processing and copies are sent to external data agencies. Eighty character card images are blocked onto a nine track tape in EBCDIC character code at a packing density of 800 bits per inch. The first ten tape records of each file contain header information (label records) revealing the station information. Within these first ten tape records the user is told the variables stored and the format of the data records which follow. GRA

N75-31948# Naval Research Lab., Washington, D.C.
A PROGRAM FOR COPYING A GEODATA DATA TAPE Final Report
Marilyn L. Blodgett and James V. Massingill 31 Mar. 1975 27 p refs
(ARPA Order 1787; NRL Proj. S01-47; ZF5255201)
(AD-A009796; NRL-7862) Avail: NTIS CSCL 09/2

A program has been written for reading a GEODATA tape and copying all or portions of the navigational, bathymetric, and magnetics data by listing, by punching cards, and/or by writing a new tape. The program can eliminate data not taken on certain dates or data which do not fall in a certain area of latitude and longitude. The program thus enables the scientist to exchange data in any convenient form while eliminating any classified information. The program was written in FORTRAN 4 for use on the CDC 3800; however the program can be converted to run on other systems with little difficulty. GRA

N75-31949# Environmental Protection Agency, Washington, D.C. Office of Program Management.
PROCEEDINGS NUMBER 1 OF THE OR AND D ADP WORKSHOP
Denise Swink Jan. 1975 322 p Conference held at Bethany College, Bethany, West Va., 2-4 Oct. 1974
(PB-241150/2; EPA-600/9-75/002) Avail: NTIS HC $9.25 CSCL 09B

The available resources, techniques, and applications in automatic data processing are within the Environmental Protection Agency are discussed. Subject areas included mathematics, scientific, and statistical applications software, minicomputer applications, interactive graphics applications, and laboratory data management. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N75-31950# RAND Corp., Santa Monica, Calif.
PRODUCTION RATE AND PRODUCTION COST
Joseph P. Large, Karl Hoffmayer, and Frank Kontrovich Dec. 1974 67 p refs
(Contract DAHC15-71-C-0220)
(AD-A009074; R-1609-PA/E) Avail: NTIS CSCL 15/5

This study examines the effect of production rate on the cost of selected types of military hardware. It was assumed that production rate and unit cost varied inversely; and if that could be established, it was hoped that an estimating model could be developed that would express that relationship for various elements of cost. The analyses described here suggest that the effect of production rate on manufacturing labor, manufacturing materials, tooling, and engineering cannot be predicted with confidence. GRA

N75-31951# RAND Corp., Santa Monica, Calif.
AN APPRAISAL OF LOGISTICS SUPPORT COSTS USED IN THE AIR FORCE IROS PROGRAM
Marco Fiorello and Patricia Konoske Dey Feb. 1975 53 p refs
(Contract F44620-73-C-0011)
(AD-A009844; R-1569-PR) Avail: NTIS CSCL 14/1

The report evaluates the KO51 logistic support cost reports used by the Air Force Increase Reliability of Operational System (IROS) program. This program, in an effort to increase the reliability of operational systems, collects detailed cost data from these reports on weapon systems and subsystems. The KO51 cost reports were assessed by comparing their costs to reference costs from other data collection systems at the base and depot levels, for the Air Force Corsair II. It is seen that the KO51 reports do not reflect certain pertinent support costs, such as costs for weapon system aerospace ground equipment, maintenance, modification hardware, and certain spares; even in those categories for which the KO51 reports do provide costs, they are reported incompletely and in a disproportionate manner.

Recommendations are made for correcting and extending the IROS KO51 reports. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N75-31952# Committee on Interstate and Foreign Commerce (U. S. House).
SURFACE TRANSPORTATION LEGISLATION
Washington GPO 1974 804 p refs Hearings on H.R. 12891, H.R. 5385, H.R. 13487, H.R. 10694, and S. 1149 (and all identical and similar bills) before Comm. on Interstate and Foreign Commerce and the Subcomm. on Transportation and Aeron., 93d Congr., 2d Sess., 26-28 Mar., 27-28 Jun., 2-3 Jul. 1974
(GPO-36-300) Avail: Comm. on Interstate and Foreign Commerce

Legislation is considered which intends to reform rail and surface transportation regulatory practices. Topics discussed include: shortage of freight cars, a rolling stock scheduling and control system, financial assistance, rate setting and taxes, and government/industry relations. Emphasis is placed on restoration and maintenance of a healthy transportation system. J.M.S.

N75-31953# Committee on Interior and Insular Affairs (U. S. House).
PROVIDING FOR A NATIONAL FUELS AND ENERGY CONSERVATION POLICY, ESTABLISHING AN OFFICE OF ENERGY CONSERVATION IN THE DEPARTMENT OF THE INTERIOR, AND FOR OTHER PURPOSES
Haley Washington GPO 10 Dec. 1974 12 p Rept. to accompany H. R. 11343 presented by the Comm. on Interior and Insular Affairs, 93d Congr., 2d Sess., 10 Dec. 1974
(H-Rept-93-1546; GPO-38-006) Avail: US Capitol, House Document Room

Amended provisions of the bill for a national fuels and energy conservation policy are presented. The bill provides for the establishment of an energy conservation program to regulate the national rate of growth in energy use and a Council on Energy Policy. Major elements of the program are described and analyzed. J.M.S.

N75-31954# Committee on Public Works (U. S. Senate).
THE NEED FOR A NATIONAL MATERIALS POLICY, PART 1
Washington GPO 1974 463 p refs Hearings before Panel on Materials Policy of Subcomm. on Environ. Pollution of Comm. on Public Works, 93d Congr., 2d Sess., 11-13 Jun. 1974
(GPO-39-885) Avail: Subcomm. on Environ. Pollution

Testimony is provided on policy issues related to the creation of a national materials recovery policy. Emphasis is placed on disposal of hazardous wastes, such as, toxic chemical, biological, and radioactive wastes, waste utilization and the relationship of the Federal government with State and local governing bodies in solid waste management and resource recovery. Other topics discussed include: waste reduction, recycling, environment protection, and resource and energy conservation. J.M.S.

N75-31955# Committee on Public Works (U. S. Senate).
THE NEED FOR A NATIONAL MATERIALS POLICY, PART 2
Washington GPO 1974 786 p refs Hearings on S. 3560, S. 3549, S. 1086, S. 3277, and S. 3954 before Panel on Materials Policy of Subcomm. on Environ. Pollution of Comm. on Public Works, 93d Congr., 2d Sess., 9-11 Jul. and 15-16 Jul. 1974
(GPO-40-687) Avail: Subcomm. on Environ. Pollution

Legislative proposals that attempt to deal with the solid waste management and resource recovery problem facing American cities are reviewed. Waste management and utilization is discussed in terms of energy conversion, conservation, and recovery. Factors discussed include: waste reduction, recycling, pyrolysis, compositing, improved waste disposal techniques, efficient use of natural resources, and materials recovery. J.M.S.

N75-31956# Committee on Public Works (U. S. Senate).
THE NEED FOR A NATIONAL MATERIALS POLICY, PART 3
Washington GPO 1974 992 p refs Hearings on S. 3560, S. 3549, S. 1086, S. 3277, and S. 3954 before Panel on Materials Policy of Subcomm. on Environ. Pollution of Comm. on Public Works, 93d Congr., 2d Sess., 17-18 Jul. 1974
(GPO-40-687) Avail: Subcomm. on Environ. Pollution

Testimony is given by the private sector on recommendations for solid waste disposal and utilization legislation. Factors discussed include: materials recovery, marketing of by-products; recycling, hazardous wastes disposal, and increased use of recovered materials by the Federal government. J.M.S.

N75-31957# Committee of Conference (U. S. Congress).
SPECIAL ENERGY RESEARCH AND DEVELOPMENT APPROPRIATION ACT, 1975
Washington GPO 30 Jun. 1974 5 p H. R. 14434 enacted into law by the 93d Congr., 30 Jun. 1974
(Pub-Law-93-322; GPO-38-139) Avail: US Capitol, House Document Room

An act making appropriations for energy research and development activities of certain departments, independent executive agencies, bureaus, offices, and commissions for the fiscal year ending June 30, 1975, and for other purposes is described. Author

N75-31958# Committee on Commerce (U. S. Senate).
OUTER CONTINENTAL SHELF OIL AND GAS LEASING OFF SOUTHERN CALIFORNIA: ANALYSIS OF ISSUES
Washington GPO Nov. 1974 99 p refs Prepared for the Comm. on Commerce pursuant to S. Res. 222, 93d Congr., 2d Sess., 12 Nov. 1974
(GPO-41-659) Avail: SOD HC $1.35

A brief history of the development of Southern California offshore continental shelf (OCS) oil and gas is given along with an outline of the Department of the Interior's OCS leasing procedures. The implications of the Interior's lease sale proposal for the coastal zone of Southern California are examined. Significant issues discussed include: role of coastal states in the Federal decisionmaking as to the siting and location of oil and gas leases; role of coastal zone management in the offshore leasing program; justification, in terms of national energy needs, availability of manpower and materials, and possible alternatives, for leasing the OCS; for nominating areas for lease in Southern California at this time. Findings and recommendations are included. J.M.S.

N75-31959# Committee on Commerce (U. S. Senate).
OUTER CONTINENTAL SHELF OIL AND GAS DEVELOPMENT AND THE COASTAL ZONE
Washington GPO Nov. 1974 206 p refs Rept. pursuant to S. Res. 222 prepared by Comm. on Commerce, 93d Congr., 2d Sess., Nov. 1974
(GPO-39-356) Avail: SOD HC $2.15

Major issues involved in leasing of the outer continental shelf are presented, and improvements in current procedures and practices are recommended. Topics discussed include information needs, exploratory and geological data, environmental and socio-economic impact on the Coastal Zone and on ocean resources, federal management and leasing policies, local control, production and transportation technology, and shortages of drilling rigs, equipment, and manpower. M.J.S.

N75-31960# Committee on Government Operations (U. S. Senate).
TO ESTABLISH AN ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION AND A NUCLEAR ENERGY COMMISSION
Washington GPO 1974 649 p refs Hearings on S. 2744 before Subcomm. on Reorganization, Res., and Intern. Organ. of Comm. on Govt. Operations, 93d Congr., 1st Sess., 4-5 Dec. and 10 Dec. 1973
(GPO-28-963) Avail: SOD HC $4.45

Testimony regarding the formation of the Energy Research and Development Administration and Nuclear Energy Commission is presented. A number of important considerations are discussed, including energy shortages, the necessity for conservation and

development of alternative energy sources, various types of available energy resources, environmental protection, agency operations, involvement of private industry, and public safety.
D.M.L.

N75-31961# Committee on Commerce (U. S. Senate).
SCIENCE AND TECHNOLOGY APPLICATIONS ACT OF 1974
Washington GPO 1974 65 p refs Joint hearing on S. 2495 amendment no. 1537 before Comm. on Commerce and Comm. on Aeron. and Space Sci., 93d Congr., 2d Sess., 11 Jul. 1974
(GPO-41-407) Avail: Comm. on Commerce

A bill is discussed which recognizes science and technology as a primary national resource, and provides for their efficient utilization in the resolution of current and potential national problems. Some of the problems discussed include: The threat of worldwide famine and the importance of continuing agricultural research and of related technological development in industry as well as in government; the need for new technologies to prevent or reverse the deterioration of our environment; the need to find new sources of energy; the modernization of out transportation systems as an essential part of maintaining a benign environment; the need to advance the science and technology required to provide general access to health care of high quality and to reduce the incidence of disease; the maintenance and improvement of government policies to ensure that American science, technology, and industry continue to flourish. Author

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N75-31962# California State Div. of Mass Transportation, Sacramento.
ENERGY USE OF PUBLIC TRANSIT SYSTEMS Final Report
Timothy J. Healy 1 Aug. 1974 64 p refs
(PB-241351/6; DMT-002) Avail: NTIS HC $4.25 CSCL 21D

The amount of energy used by a variety of transit modes operating under different conditions was determined. Projections of energy availability in California through 1985 and 1990 are reviewed and the implications for transportation are discussed. A short summary of the ways in which vehicles use energy, and an analysis of the resulting implications for energy-limiting or conserving strategies are given. Energy consumption data for a wide variety of vehicles operating in a number of modes are compared in a way that allows the reader (planner) to know relative energy requirements of different systems. GRA

N75-31963# Department of Transportation, Washington, D.C. Office of Consumer Affairs.
THE VOICE OF THE TRANSPORTATION CONSUMER: A REPORT TO THE SECRETARY OF TRANSPORTATION ON NATIONWIDE CONSUMER PUBLIC HEARINGS CONDUCTED BY THE OFFICE OF CONSUMER AFFAIRS, 1971 - 1974. EXECUTIVE SUMMARY Final Report
Apr. 1975 116 p
(PB-241764/0; DOT/TES/OCA-75/1) Avail: NTIS HC $5.25; also available $19.00/set of 2 reports as PB-241778-SET CSCL 05A

The Executive Summary includes the background and objectives of the 54 nationwide transportation consumer public hearings held 1971-1974, an overview of the findings, and a summary of transportation concerns identified at the hearings. Subject areas include: balanced transportation; transportation planning; transportation funding; citizen participation in transportation planning; elderly and handicapped; energy; environment; rural transportation; technology; automobile; aviation; bicycles; bus; highways; motorcycles; pedestrians; rail; rapid transit; trucks; and water transportation. GRA

88 SPACE SCIENCES (GENERAL)

N75-31964*# Kanner (Leo) Associates, Redwood City, Calif.
THE SPACE ACTIVITIES OF SPAIN
D. Luis Pueyo Panduro Washington NASA Sep. 1975 52 p Transl. into ENGLISH from Ing. Aeron. y Astronautica (Spain), v. 26, Jul. - Aug. 1974 p 53-74
(Contract NASw-2790)
(NASA-TT-F-16545) Avail: NTIS HC $4.25 CSCL 05B

One part of the Spanish space program is related to the installation and operation of ground stations in accordance with international agreements. These stations have participated in space missions of NASA, CNES, and ESRO. A description of space activities conducted during the period from 1968 to 1973 is presented, giving attention to studies of the neutral atmosphere, the ionosphere, cosmic radiation, astrophysics, radio astronomy, geophysics, geodetics and other activities, including the determination of meteorite age and the analysis of lunar materials provided by NASA. Technological activities are considered, taking into account the satellite INTASAT and two sounding rockets. Industrial activities are discussed along with international relations and contributions of Spain to the European space program. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-31965*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LIMIT CYCLE ANALYSIS OF LARGE SPACE TELESCOPE WITH CMG NONLINEARITY
S. M. Seltzer, B. C. Kuo, and G. Singh Jun. 1975 22 p refs Presented at the AIAA and Control of Flight Conf., Anaheim, Calif., 5-9 Aug. 1974
(NASA-TM-X-64939; Paper-74-874) Avail: NTIS HC $3.25 CSCL 03A

The existence and characteristics of self-sustained oscillations were studied in the Large Space Telescope (LST) system due to the presence of nonlinear gimbal friction in the control moment gyroscopes (CMG's). A continuous data single-axis model of the LST is considered. A solid friction model is used to represent CMG gimbal friction. A rigorous mathematical model is derived for use in a continuous describing function analysis. Conditions for self-sustained oscillations are then determined. Author

N75-31966*# Lowell Observatory, Flagstaff, Ariz. Planetary Research Center.
[ASTEROID OBSERVATIONS AND PLANETARY ATMOSPHERES ANALYSIS] Semiannual Status Report, 1 Jan. - 30 Jun. 1975
William A. Baum, Robert L. Millis, and Edward L. G. Bowell 12 Sep. 1975 11 p refs
(Grant NGR-03-003-001)
(NASA-CR-143442; SASR-24) Avail: NTIS HC $3.25 CSCL 03A

Photoelectric observations of Eros and 30 other asteroids providing information on their surface characteristics, shape, and rotation axes are reported. Photographs of 18 asteroids and 4 comets yielding accurate position information on various dates were obtained. Photometric observations were made of the Saturn satellite Iapetus, and electronographic images of the Uranus and Neptune satellites were obtained experimentally with a Spectracon tube to assess photometry by that method. Planetary patrol photographs of Venus and deconvolved area scans of Uranus were taken. UBV photometry of the Galilean satellites for the period 1973-1974 was completely analyzed and accepted for

publication. An improved magnitude and color index for Minas were derived from 1974 area scans. A special photomultiplier tube with a suppressor grid was incorporated into a pulse-counting photometer with special added circuitry for carrying out the observations concerning the constancy of solar system dimensions over cosmic time. Author

N75-31967*# Perkin-Elmer Corp., Norwalk, Conn. Electro-optical Div.
THE 100 cm SOLAR TELESCOPE PRIMARY MIRROR STUDY
Mar. 1975 76 p refs
(Contract NAS5-20776)
(NASA-CR-144673; Rept-12421) Avail: NTIS HC $4.75 CSCL 03A

The manufacturing impact of primary mirror configuration on the performance of a 100 cm aperture solar telescope was studied. Three primary mirror configurations were considered: solid, standard lightweight, and mushroom. All of these are of low expansion material. Specifically, the study consisted of evaluating the mirrors with regard to: manufacturing metrology, manufacturing risk factors and ultimate quality assessment. As a result of this evaluation, a performance comparison of the configurations was made, and a recommendation of mirror configuration is the final output. These evaluations, comparisons and recommendations are discussed in detail. Other investigations were completed and are documented in the appendices. Author

N75-31968*# Agnew Tech-Tran, Woodland Hills, Calif.
ZELENCHUKSKAYA TELESCOPE
Washington NASA Sep. 1975 8 p Transl. into ENGLISH from Informal Russian Report 8 p
(Contract NASw-2789)
(NASA-TT-F-16621) Avail: NTIS HC $3.25 CSCL 03A

The recently-constructed Russian ZELENTCHUKSKAYA telescope is described which is now the largest telescope in the world. Details are presented concerning the selection of its construction site, the construction of the telescope itself, and its dimensions. The purpose of this newest addition to astronomic instruments is to extend the threshold of knowledge concerning the Universe by actual observation through a telescope of a size and magnification quality heretofore nonexistent. Author

N75-31969*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SCIENTIFIC OPERATIONS PLANNING FOR THE LST
Donald K. West Sep. 1975 18 p Presented at Am. Astronautical Soc. 21st Ann. Meeting Space Shuttle Missions, 26-28 Aug. 1975
(NASA-TM-X-70975; X-604-75-239) Avail: NTIS HC $3.25 CSCL 03A

A Large Space Telescope (LST) ground system which is compatible with the operational requirements of LST is described. The goal of this approach to the ground system was to minimize the cost of post launch operations without seriously compromising the quality and total throughput of LST science, or jeopardizing the safety of the LST in orbit. The accomplishment of this goal through optimum use of existing and planned resources and institutional facilities is discussed. Cost is shown to be reduced and efficiency in operation increased by drawing on existing experience in interfacing guest astronomers with spacecraft as well as mission control experience obtained in the operation of present astronomical spacecraft. The ground system was limited to the mission and data operations elements of the total LST Program. The planning and implementation of science programs in both a long-range and daily time frame is also discussed. Author

N75-31970# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
THE CAUSE OF THE MAXIMUM INTENSITY OF THE 1665 MHz RADIO LINE IN THE OH MASER SOURCES ASSOCIATED WITH H 2 REGIONS
V. V. Burdjuzha 1974 13 p refs
(PR-199) Avail: NTIS HC $3.25

A possible cause leading to the maximum intensity in the 1665 MHz radio line in the OH maser sources associated with H2 regions, is the conservation of a resonant line in the far-infrared spectrum distorted after the passage of a certain optical depth. This line, together with the infrared cascade, provides a population transfer from the inverted F = 2(+) level to the inverted F = 1(+) level of the rotational ground state of the OH molecule. An observational test is proposed. Author (ESRO)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-31971# California Univ., Los Angeles.
ASYMMETRIC PLANETARY ELECTRICAL INDUCTION Ph.D. Thesis
Bryan Lee Horning 1975 219 p
Avail: Univ. Microfilms Order No. 75-16787

An analytic theory was developed for both the steady-state and time-dependent electric and magnetic fields inside planetary objects which possess neither an atmosphere nor an intrinsic magnetic field and for the fields in their downstream cavities when interplanetary electromagnetic field fluctuations are incident at arbitrary angles to the cavity axis. The planetary model has electrical conductivity, electrical permittivity, and magnetic permeability which vary arbitrarily with radius. The cavity downsteam of the planet is assumed to be an infinitely long nonconducting cylinder. The interplanetary medium is assumed infinitely conducting. Numerical evaluation of the analytic formulas was carried out in the steady-state interaction problem for a uniformly conducting spherical model. The quantities computed include the induced electrical and magnetic fields, the total current and power dissipated in the body, the radial electromagnetic stress on the incident plasma, and the flow pattern of the sheet currents. Dissert. Abstr.

N75-31972 California Univ., Los Angeles.
DYNAMICAL STUDIES OF SATELLITE ORIGIN Ph.D. Thesis
Alan William Harris 1975 130 p
Avail: Univ. Microfilms Order No. 75-16784

Models of growth of a planet-satellite pair are formulated. It is shown that the orbit of a growing satellite is affected by tidal friction, which generally causes outward evolution, and inward spiraling caused by the drag effect of the accretion process. Results are presented and discussed. Dissert. Abstr.

N75-31973 Texas Univ., Austin.
THE STRUCTURE OF GENERAL RELATIVITY WITH A NUMERICAL ILLUSTRATION: THE COLLISION OF TWO BLACK HOLES Ph.D. Thesis
Larry Lee Smarr 1975 210 p
Avail: Univ. Microfilms Order No. 75-16738

The splitting of spacetime into space and time is analyzed by abstract methods, coordinate methods, and numerical computer methods. The axisymmetric Einstein equations are discussed, and it is shown how to set up a numerical computer program to integrate these equations starting with a given initial data set. Various applications of this computer approach are discussed which would involve generation of gravitational radiation from the formation of black holes. The particular case of two nonrotating black holes colliding headon is chosen as a test case for the computer. The initial value problem is reviewed and then a computer program is written to generate the spacetime. This generation involves solving four coupled quasilinear hyperbolic (evolution) equations and one linear elliptic equation (maximal slicing) on each spacelike sheet. The numerical difficulties are discussed and graphical methods are used to present the result of the computations. Dissert. Abstr.

N75-31974 Iowa State Univ. of Science and Technology, Ames.
SALTATION IN TERRESTRIAL AND MARTIAN ATMOSPHERES Ph.D. Thesis
Bruce Richard White 1975 209 p
Avail: Univ. Microfilms Order No. 75-17417

The eolin mechanics of salting particles in Earth and Martin atmospheres are examined. This phenomonon was studied by both an experimental investigation of the flow field around a

model crater in an atmospheric boundary layer wind tunnel and numerical solutions of the two- and three-dimensional equations of motion of a single particle under the influence of a turbulent boundary layer. Major findings include a comparison between Earth and Mars particle trajectories for equal ratios of friction to threshold friction speeds that shows Mars length scales in trajectories to be larger and with higher terminal particle velocities with lower collision angles at the surface than Earth's. Other significant results include simulated particle flow in the wake of a crater with a horseshoe vortex that shows extremely high terminal velocities and smaller than normal collision angles, especially for smaller particles, resulting in high erosion rates at the surface. Further, turbulence was shown not to play a major role in shaping particle trajectories, except for small particles.
Dissert. Abstr.

N75-31975 Cornell Univ., Ithaca, N.Y.
DYNAMICAL MODELS OF DUST-FILLED PLANETARY NEBULAE Ph.D. Thesis
Richard Lawrence Ferch 1975 222 p
Avail: Univ. Microfilms Order No. 75-18128

A series of computer models of planetary nebulae have been constructed for nebulae of 0.15 and 0.5 solar masses, containing normal, one tenth, and ten times normal dust amounts. A variety of initial conditions were used. The hydrodynamics of the gas were calculated using the Richtmyer-von Neumann pseudoviscosity method. The temperature in the ionized region was assumed a priori, and the dust grains in the nebulae were treated as charged particles moving under the influence of both radiation pressure and drag due to the gas. The transfer of ionizing radiation was treated by the on-the-spot approximation, while the transfer of Lyman-alpha was computer using a Monte Carlo technique. In all of the models used, the dust moved little relative to the gas. The expansion velocity was roughly constant near the density peak, increased with time and linearly with distance in the tail. Author

N75-31976 Florida Univ., Gainesville.
THE FORMATION OF A CONTACT BINARY STAR SYSTEM Ph.D. Thesis
Elisabeth Fentress Ferratt Mullen 1974 154 p
Avail: Univ. Microfilms Order No. 75-16425

The process of forming a contact binary star system was investigated. A preliminary stage of mass transfer was proposed and studied through the use of a computer program which calculates evolutionary model sequences. The detailed development of both stars was followed in these calculations, and findings regarding the internal structure of the star which is receiving the mass are presented. Relaxation of the mass-gaining star was also studied. A contact system was formed through these calculations; it exhibits the general properties of a W Ursae Majoris system. The initial masses selected for the calculation were 1.29 and 0.56 solar mass respectively. After about 25 million years, the less massive star will fill its Roche lobe and an initial contact system is obtained. The internal structure of the secondary component is considered different from that of a main sequence star of the same mass. Dissert. Abstr.

N75-31977 Wisconsin Univ., Milwaukee.
GRAVITATIONAL OPTICS: A STUDY OF NULL GEODESICS AND GRAVITY WAVES IN THE GEOMETRY PRODUCED BY A STAR Ph.D. Thesis
John F. Cyranski 1974 167 p
Avail: Univ. Microfilms Order No. 75-17804

The theory of scattering of neutrinos and of gravity radiation by the weak gravitational field of a spherically symmetric star was presented, with emphasis on penetration of the star by the radiation. The existence of caustics, foci, and an axicon effect was demonstrated using null-geodesics (ray tracing) for neutrinos and high frequency gravity waves. These optical phenomena, provided they can be empirically located, may be used to find the stellar density function. It was shown that these results apply to frequencies of gravity radiation that are too high to occur naturally, and a wave optics was therefore developed. Einstein's solutions for a non-trivial background metric were perturbed, and the resultant equations were solved assuming a linear expansion of the background and a distorted-wave Born approximation. Dissert. Abstr.

N75-31978*# Texas Univ., Austin. Applied Mechanics Research Lab.
EVALUATION OF GEOPOTENTIAL AND LUNI-SOLAR PERTURBATIONS BY A RECURSIVE ALGORITHM
G. E. O. Giacaglia Aug. 1975 19 p refs
(Contract NGR-44-012-269)
(NASA-CR-143500; AMRL-1073) Avail: NTIS HC $3.25 CSCL 03B

The disturbing functions due to the geopotential and Luni-solar attractions are linear and bilinear forms in spherical harmonics. Making use of recurrence relations for the solid spherical harmonics and their derivatives, recurrence formulas are obtained for high degree terms as function of lower degree for any term of those disturbing functions and their derivative with respect to any element. The equations obtained are effective when a numerical integration of the equations of motion is appropriate. In analytical theories, they provide a fast way of obtaining high degree terms starting from initial very simple functions. Author

N75-31979*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SENSITIVITY LIMITS OF AN INFRARED HETERODYNE SPECTROMETER FOR ASTROPHYSICAL APPLICATIONS
M. M. Abbas, M. J. Mumma, T. Kostiuk, and D. Buhl Sep. 1975 44 p refs Submitted for publication
(NASA-TM-X-70972; X-692-75-213) Avail: NTIS HC $3.75 CSCL 03B

A discussion and an evaluation of the degradation in sensitivity is given for a heterodyne spectrometer employing a HgCdTe photodiode mixer and tunable diode lasers. The minimum detectable source brightness is considered as a function of the mixer parameters, transmission coefficient of the beam splitter, and local oscillator emission powers. The degradation in the minimum detectable line source brightness which results from the bandwidth being a function of the line width is evaluated and plotted as a function of the wavelength and bandwidth for various temperature to mass ratios. It is shown that the minimum achievable degradation in the sensitivity of a practical astronomical heterodyne spectrometer is approximately 30. Estimates of signal-to-noise ratios with which infrared line emission from astronomical sources of interest may be detected are given.
Author

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N75-31980 Washington Univ., Seattle.
KRYPTON AND XENON IN LUNAR AND TERRESTRIAL SAMPLES Ph.D. Thesis
Richard James Drozd 1974 366 p
Avail: Univ. Microfilms Order No. 75-6590

Results of heavy rare gas measurements on lunar and terrestrial samples are reported. Lunar breccias and basalts returned by the Apollo 14, 15, and 16 missions were studied. Terrestrial uranium ores from Rabbit Lake, Saskatchewan, Canada, and Oklo, Republic of Gabon, were examined for their fission rare gas content. Analysis of lunar samples confirms the results that fission xenon from the decay of Pu-244 is present in lunar samples. These xenon components in the gas-rich Apollo 14 breccias appear to have been formed in the lunar interior and subsequently incorporated into the surfaces of grains from which these breccias formed. Xenon and krypton isotopic studies on two samples from the Oklo mine confirm that it was the site of a natural spontaneous chain reaction. By a method insensitive to xenon gas loss an integrated neutron fluence for the Oklo samples is calculated. A probable time limit for the active period at Oklo of between 14,000 and 70,000 years is obtained. Rabbit Lake samples show no evidence for a self-supporting chain reaction. Dissert. Abstr.

N75-31981 State Univ. of New York, Stony Brook.
THE LUNAR NEUTRON SOURCE FUNCTION Ph.D. Thesis
Joseph Joshua Kornblum 1974 192 p
Avail: Univ. Microfilms Order No. 75-16205

An estimate of the lunar neutron source function below 15 Mev was obtained by combining the available pertinent experimental measurements with theoretical calculations. A source function with adjustable parameters was first assumed for neutrons below 15 Mev. The resulting neutron fluxes were determined by means of a transport calculation. A thermalization calculation was carried out to determine the thermal neutron spectrum. Production rates are calculated by combining the neutron fluxes with pertinent neutron capture cross sections. The source function parameters are then adjusted to give agreement with the shapes and intensities of the relevant neutron experimental data. Neutron fluxes were calculated by a discrete-ordinate method for Apollo 11 and Apollo 16 soils using appropriately small energy intervals below 15 Mev. A comparison with previous neutron calculations was made and significant differences discussed. One conclusion is the moon is losing mass. Dissert. Abstr.

N75-31982*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ON THE PETROLOGICAL, GEOCHEMICAL, AND GEOPHYSICAL CHARACTERIZATION OF A RETURNED MARS SURFACE SAMPLE AND THE IMPACT OF BIOLOGICAL STERILIZATION ON THE ANALYSES
Apr. 1974 387 p refs
(NASA-TM-X-72501) Avail: NTIS HC $10.25 CSCL 03B

A study was conducted: to identify those experiments that could and should be done on a returned Martian sample in order to characterize its inorganic properties; to evaluate, insofar as can be done, the effects of potential biological sterilization of the sample by heating prior to its return; to identify particular analytical techniques needing further improvement in order to make optimum use of a returned sample; and to identify experiments to be done on simulants, with and without sterilization, that better define the limits of information available about the planet from analyses of returned samples. Author

N75-31983*# California Inst. of Tech., Pasadena.
APOLLO PROGRAM SOIL MECHANICS EXPERIMENT Final Report
R. F. Scott [1975] 30 p refs
(Contract NAS9-11454)
(NASA-CR-144438) Avail: NTIS HC $3.75 CSCL 08M

The soil mechanics investigation was conducted to obtain information relating to the landing interaction of the lunar module (LM) with the lunar surface, and lunar soil erosion caused by the spacecraft engine exhaust. Results obtained by study of LM landing performance on each Apollo mission are summarized. M.J.S.

N75-31984*# Santa Clara Univ., Calif.
STUDIES IN MATTER ANTIMATTER SEPARATION AND IN THE ORIGIN OF LUNAR MAGNETISM Annual Progress Report, 1 Sep. 1974 - 31 Aug. 1975
William A. Barker, Ronald Greeley, Curtis Parkin, Hans Aggarwal, and Peter Schultz 31 Aug. 1975 33 p refs
(Grant NGR-05-017-027)
(NASA-CR-143428) Avail: NTIS HC $3.75 CSCL 03B

A progress report, covering lunar and planetary research is introduced. Data cover lunar ionospheric models, lunar and planetary geology, and lunar magnetism. Wind tunnel simulations of Mars aeolian problems and a comparative study of basaltic analogs of Lunar and Martial volcanic features was discussed. E.H.W.

N75-31985*# Catholic Univ. of America, Washington, D.C.
MAGNETOSPHERE OF MERCURY Semiannual Progress Report, Mar. - Aug. 1975
Y. C. Whang Aug. 1975 26 p refs
(Grant NGR-09-005-063)
(NASA-CR-143429) Avail: NTIS HC $3.75 CSCL 03B

A model magnetosphere of Mercury using Mariner 10 data is presented. Diagrams of the bow shock wave and magnetopause are shown. The analysis of Mariner 10 data indicates that the magnetic field of the planet is intrinsic. The magnetic tail and secondary magnetic fields, and the influence of the solar wind are also discussed. J.R.T.

N75-31986*# Massachusetts Inst. of Tech., Cambridge.
PRECISION SELENODESY VIA DIFFERENTIAL VERY-LONG-BASELINE INTERFEROMETRY Ph.D. Thesis
Robert Wilson King, Jr. Jun. 1975 173 p refs
(Contract NAS5-11947; Grant NsG-7010)
(NASA-CR-143452) Avail: NTIS HC $6.25 CSCL 03B

The technique of differential very-long baseline interferometry was used to measure the relative positions of the ALSEP transmitters at the Apollo 12, 14, 15, 16, and 17 lunar landing sites with uncertainties less than 0.005 of geocentric arc. These measurements yielded improved determinations of the selenodetic coordinates of the Apollo landing sites, and of the physical libration of the moon. By means of a new device, the differential Doppler receiver (DDR), instrumental errors were reduced to less than the equivalent of 0.001. DDRs were installed in six stations of the NASA spaceflight tracking and data network and used in an extensive program of observations beginning in March 1973. Author

N75-31987*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PRIMER IN LUNAR GEOLOGY
Ronald Greeley, ed. and Peter Shultz, ed. [1974] 551 p refs Prepared in cooperation with Santa Clara Univ., Calif.
(Grant NsG-07013)
(NASA-TM-X-72499) Avail: NTIS HC $13.00 CSCL 03B

The papers and reference material that were used for a short course in lunar geology conducted in April 1974 at NASA-Ames Research Center were collected in the form of a primer. The objective of the short course was to provide a foundation in lunar geology for earth-science community college instructors. The objective of the primer was to provide short summaries, selected illustrations, and pertinent reprinted articles dealing with primary topics in lunar geology so that the reader could more easily become familiar with the subject. Author

N75-31988*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A SHORT COURSE IN LUNAR GEOLOGY FOR EARTH SCIENCE INSTRUCTORS Final Report, 1 Jan. 1974 - Feb. 1975
Ronald Greeley and Peter Shultz Feb. 1975 11 p ref Prepared in cooperation with Santa Clara Univ., Calif.
(Grant NsG-07013)
(NASA-TM-X-72498) Avail: NTIS HC $3.25 CSCL 03B

A four-day short course in lunar geology was developed, leading to the publication of a primer in lunar geology. The course was offered to 22 sponsored participants (community college teachers) and to representatives from the Lunar Science Institute, Houston, Texas, and from the Educational Program Office of NASA-Ames, on April 25-28, 1974. A follow-up survey of the course participants was made in two steps: on the last day of the course, and one year later. In general, the participants felt that the course was well organized and that the speakers were effective. Most of the participants introduced some aspects of what they learned into their own teaching material. Finally, a well-panel display about 7 1/2 feet high and 16 feet long designed to acquaint the viewer with elementary facts of lunar geology was constructed and permanently installed at the Space Science Center of Foothill College. Y.J.A.

N75-31989*# Agnew Tech-Tran, Woodland Hills, Calif.
FROM THE PAST OF METEORITES
B. Levin and A. N. Simonenko Washington NASA Sep. 1975 21 p refs Transl. into ENGLISH from Priroda (Moscow), no. 7, Jul. 1975 p 38-45
(Contract NASw-2789)
(NASA-TT-F-16537) Avail: NTIS HC $3.25 CSCL 03B

Studies of the structure and composition of meteorites which have revealed important knowledge of the origin and formation of meteorites are discussed. Such research suggests that meteorites originated initially from asteroids that underwent collisions and disintegrated into smaller fragments. Tracks formed by penetrating solar cosmic rays suggest that meteorites represent consolidated regoliths formed on the surface of the formative

bodies. The imputance of the intermixing of meteoritic matter within its body is discussed. The results of studies of recently discovered carbonaceous chondrites also support the theory that meteorites were formed under conditions of balanced condensation of refractory matter in a cooling protoplanetary disc. Author

N75-31990*# Lamont-Doherty Geological Observatory, Palisades, N.Y.
STUDY OF THERMAL PROPERTIES OF THE LUNAR REGOLITH BASED ON IN SITU TEMPERATURE MEASUREMENTS AND EXPERIMENTS ON SOIL SIMULANTS Final Technical Report, 1 Feb. 1972 - 1 Aug. 1973
Marcus G. Langseth and Ki-iti Horai 1 Aug. 1973 21 p
(Grant NGR-33-008-174)
(NASA-CR-143621) Avail: NTIS HC $3.25 CSCL 03B

The experimental design and the development of a theory to interpret the experimental data from measurements of the thermal conductivity of lunar core samples. Measurements conducted while the lunar material is still in the core tube reduce the possibility of physical and chemical disturbances to the sample. The sample was heated externally by radiation at a known rate, the variation of temperature was measured at the surface of the core sample, and thermal conductivity was determined by comparing the observed temperature with the theoretically expected one. M.J.S.

N75-31991*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE PIONEER PROJECTS: ECONOMICAL EXPLORATION OF THE SOLAR SYSTEM
J. Richard Spahr and Charles F. Hall Sep. 1975 16 p refs Presented at Intern. Astronautical Federation 26th Congr., Lisbon, 21-27 Sep. 1975
(NASA-TM-X-62481; A-6255) Avail: NTIS HC $3.25 CSCL 22A

The interplanetary Pioneer missions are reviewed in terms of management implications and cost control. The responsibilities, organizational structure, and management practices of the Pioneer Projects are presented. The lines of authority and areas of responsibility of the principal organizational elements supporting the Pioneer missions are identified, and the methods employed for maintaining effective and timely interactions among these elements are indicated. The technical and administrative functions of the various organizational elements of the Pioneer Project Office at Ames Research Center are described in terms of their management responsibilities and interactions with other elements of the Project Office and with external organizations having Pioneer Project responsibilities. The management and control of activities prior to and during the hardware procurement phase are described to indicate the basis for obtaining visibility of the technical progress, utilization of resources, and cost performance of the contractors and other institutions supporting the Pioneer projects. Author

N75-31992*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PIONEER 11'S ENCOUNTER WITH JUPITER AND MISSION TO SATURN
John W. Dyer Sep. 1975 22 p refs Presented at the Intern. Astronautical Federation 26th Congr., Lisbon, 21-27 Sep. 1975
(NASA-TM-X-62480; A-6257) Avail: NTIS HC $3.25 CSCL 03B

Plans for Pioneer 11's approach to Saturn are described. A flyby somewhat parallel to the ring plane is being proposed as an interim target, with a future option held for a possible high risk (or suicide) plunge through the nearly transparent space between Saturn and its rings. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-31993# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Jun. 1974
Massimo Cimino Jun. 1974 9 p
(Publ-194) Avail: NTIS HC $3.25

Solar data for June 1974 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields, and hours of K-line and H alpha cinematographic patrol. ESRO

N75-31994# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Jul. 1974
Massimo Cimino Jul. 1974 13 p
(Publ-195) Avail: NTIS HC $3.25

Solar data for July 1974 are presented. Tables include: daily total areas of sunspot groups, heliographic position, classification and area of sunspot groups, longitudinal sunspot magnetic fields, and hours of K-line and H alpha cinematographic patrol. ESRO

N75-31995# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Aug. 1974
Massimo Cimino Aug. 1974 12 p
(Publ-196) Avail: NTIS HC $3.25

Solar data for August 1974 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields, and hours of K line and H alpha cinematographic patrol. ESRO

N75-31996# Bonn Univ. (West Germany). Inst. fuer Astrophysik.
RESULTS OF THE LYMAN ALPHA MEASUREMENTS OF THE SATELLITE DIAL Final Report [ERGEBNISSE DER LYMAN-ALPHA MESSUNGEN DES SATELLITEN DIAL]
Hans Dieter Schlichter Bundesmin. fuer Forsch. u. Technol. Jan. 1975 104 p refs In GERMAN; ENGLISH summary Prepared jointly with DFVLR, Oberpfaffenhoffen
(Contract WRK-219/253)
(BMFT-FB-W-75-01) Avail: NTIS HC $5.24: ZLDI, Munich DM 21.85

Construction and scientific objectives of the Lyman-alpha-photometer in the dial satellite as well as the effects of the photolitic decomposition of the filling gas nitric oxide of the ionization chamber detectors are described. The data that were obtained for March through May 1970 are presented and discussed. The measurements clearly show the existence of an asymmetric hydrogen distribution. They close a gap in the OGO-4 observations. Furthermore, the measurements make evident that a strict correlation of the exospheric temperature to solar activity parameters only is not possible. An estimation of the Lyman-alpha-background is in good agreement with the measurements of the OGO-5 satellite. Finally, an up to now never registered reaction of the geocoronal Lyman-alpha-airglow was found.
Author (ESRO)

N75-31997# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
INTRODUCTION TO SOLAR-TERRESTRIAL PHENOMENA AND THE SPACE ENVIRONMENT SERVICES CENTER
Stephen J. Mangis Jan. 1975 70 p refs
(COM-75-10501/5; NOAA-TR-ERL-315; SEL-32; NOAA-75032412) Avail: NTIS MF $2.25; SOD HC as C55.13:ERL315-SEL32 CSCL 03B

This report is an introduction to solar-terrestrial phenomena for those with no special background in astrophysics or solar astronomy. Discussions of physics have been kept to a minimum, with emphasis on phenomonology instead. An individual completely unfamiliar with solar events should, after reading this volume, be able to read and understand the SESC Report and Forecast of Solar Geophysical Activity and be able to apply its contents to his particular area of concern. Subjects discussed are solar structure and processes, solar sctivity, and solar-terrestrial relations. There is a brief description of the Space Environment Services Center's activities. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N75-31998*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MEASUREMENT OF THE PRIMARY COSMIC ELECTRON SPECTRUM FROM 10 TO ABOUT 250-GeV

Robert F. Silverberg Aug. 1975 41 p refs Submitted for publication

(NASA-TM-X-70973; X-661-75-218) Avail: NTIS HC $3.75 CSCL 03B

The intensity and energy spectrum of primary cosmic electrons from 10 to approximately 250 GeV was studied using balloon-borne detectors. Both of the detectors were large area ionization calorimeters with frequent sampling of showering particles and were capable of energy resolution of approximately 7%. A time-of-flight system and detectors to sample the lateral properties of showers were used to examine and improve background rejection. The results of the balloon flights from Alamogordo, N.M. in 1970 and Cape Girardeau, Missouri in 1972 indicated that the primary cosmic ray electron differential energy spectrum exhibits no change of slope in the energy range measured and is well represented by a power law. These results indicate that the cosmic electron spectrum is steeper than the cosmic ray proton spectrum. It is shown that these data are consistent with the leakage lifetime model for the propagation of cosmic electrons in the Galaxy, although other more complex models cannot be excluded on the basis of these data. Author

N75-31999# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.

SOLAR-GEOPHYSICAL DATA NUMBER 367. PART 1 (PROMPT REPORTS): DATA FOR FEBRUARY 1975 - JANUARY 1975. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 366(SUPPLEMENT) FEBRUARY 1975

Hope I. Leighton Mar. 1975 114 p

(COM-75-50193-367-1; SGD-367-Pt-1; NOAA-75041503) Avail: NTIS MF $2.25; HC avail. from National Climatic Center, Attn: Publications. Federal Bldg., Asheville, N. C. 28801. Subscription $34.50/year includes Part 1 (Prompt Reports) and Part 2 (Comprehensive Reports); $18.00/year for either part. Annual supplement containing explanation is included. $1.40/copy for either part; $1.30 for extra issue CSCL 03B

Prompt reports are given on data for February 1975 and January 1975. These deal with alert periods, daily solar indices, solar flares, solar radio waves, solar wind measurements, solar X-ray radiation, inferred IP magnetic field polarities, daily solar activity centers, sudden ionospheric disturbances, cosmic rays, geomagnetic indices, and radio propagation indices. GRA

N75-32000# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.

SOLAR-GEOPHYSICAL DATA 367. PART 2 (COMPREHENSIVE REPORTS): DATA FOR SEPTEMBER 1974 - AUGUST 1974 AND MISCELLANEA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 366 (SUPPLEMENT) FEBRUARY 1975

Hope I. Leighton Mar. 1975 62 p

(COM-75-50193-367-2; SGD-367-Pt-2; NOAA-75041504) Avail: NTIS MF $2.25; HC avail. from National Climatic Center, Attn: Publications. Federal Bldg., Asheville, N. C. 28801. Subscription $34.50/year includes Part 1 (Prompt Reports) and Part 2 (Comprehensive Reports); $18.00/year for either part. Annual supplement containing explanation is included. $1.40/copy for either part; $1.30 for extra issue CSCL 03B

Comprehensive reports are given on data for September 1974 and August 1974. These deal with solar flares, solar radio waves, magnetograms of geomagnetic storms, abbreviated calendar record, regional flare index, and X-ray spectroheliograms. GRA

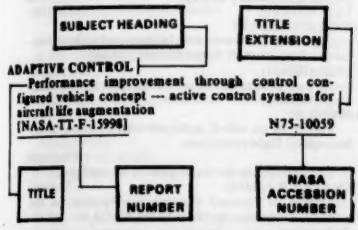
99 GENERAL

No abstracts in this category.

SUBJECT INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 13 NUMBER 22

TYPICAL SUBJECT INDEX LISTING



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A

A-7 AIRCRAFT
A-7 aloft hardware requirements environmental analysis — fiber-optic equipment and light emitting diodes
[AD-A009355] N75-31063

ABORTED MISSIONS
Results of an external tank separation test in AEDC/VKF tunnel B on 0.010-scale replica of space shuttle vehicle model 52-OT[IA17A], Volume 1
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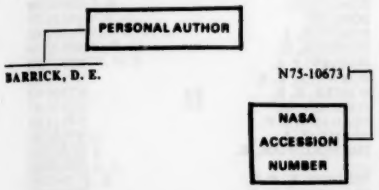

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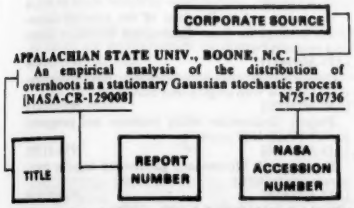
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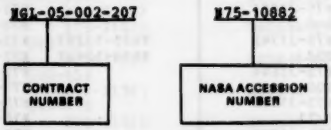

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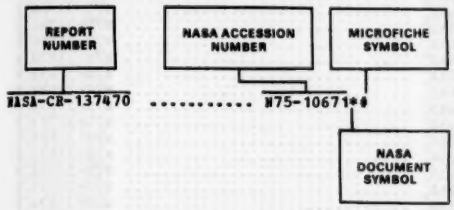

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